MASTER SERVICE MANUAL

Chapter 9—Service

Service Operations on Type 1A Flooded Systems (Continued)

By K. M. Newcum

Service Operation No. 11. Changing the Float Valve: (Ball Type.)

a. Close valve No. 3.

b. Start compressor and block low pressure control to keep compressor in operation.

c. Operate compressor until the entire evaporator has defrosted and the back pressure is down to around 25 in. vacuum.

d. Stop compressor. If evaporator is completely evacuated the back pressure will not increase. If the pressure builds up, start and operate the compressor for several more minutes, or until with the compressor idle, the pressure does not build up.

e. Wipe all the parts of evaporator completely dry, so that no moisture will get into the system when it is opened.

f. By-pass through combination gauge set to build the pressure in the low side of 0 lb. pressure, then close valves 7 and 6. This breaks the vacuum to prevent air from being drawn in when the system is opened.

g. Close valves 4, 5, and 1.

h. Disconnect liquid and suction lines from valves 4 and 5.

i. Remove valves 4 and 5 if necessary.

j. Remove present float valve. Clean all gasket surfaces.

k. Install new float valve, using all new gaskets.

l. Reinstall valves Nos. 4 and 5.

m. Reconnect liquid and suction lines.

n. Purge liquid line. Test for leaks, then open valve No. 3 allowing liquid line to fill, then close valve No. 3.

o. Loosen suction line flare nut at valve No. 1. Open valve No. 5. Then crack valve No. 4 allowing pressure from liquid line to enter evaporator and purge air from evaporator and suction line. Close valve No. 4 and tighten suction line at valve No. 1.

p. Open valve No. 1. By-pass pressure from high-side to low-side through gauge set to 35 lb., then close valves Nos. 6 and 7.

q. Test all low-side connections for leaks, especially around float valve.

r. Open valves Nos. 3 and 4 and put compressor into operation.

Service Operation No. 12. Changing the Cartridge-type Needle-seat Assembly. See Figs. 91 and 92.

a. Proceed as in operation 11—through steps a, b, c, d, e, f, and g.

b. Disconnect liquid line from valve No. 4.

c. Remove valve No. 4.

d. Remove cartridge-type needle-seat assembly as described in Chapter 5.

e. Install new cartridge-type needle-seat assembly (see Chapter 5).

f. Reinstall valve No. 4.

g. Reconnect liquid line.

h. Proceed as in operation No. 11 starting with step "N." on through to and including step "R."

Service Operation No. 13. Removing Oil From An Oil-logged Evaporator:

a. Evacuate evaporator just as in operation No. 11, steps a, b, c, d, e, f, g, and h.

b. Remove entire evaporator from the refrigerator to the outside.

c. Remove the float valve and turn the evaporator upside down and pour all the oil from it.

d. Install a new float valve correctly calibrated, just as in step "K," operation 12.

e. Reinstall valves Nos. 4 and 5.

f. Reinstall evaporator in refrigerator.

g. Follow through as in steps "M" to "R," inclusive, in operation 11.

Note: If the refrigerant involved is SO_2, aproximately 1 lb. of refrigerant oil should be added to the compressor. With methyl chloride, isobutane or Freon, the system should be allowed to operate for several hours and then checked for a possible shortage of oil. If a shortage is noticed, only sufficient oil to properly lubricate the compressor should be added.

Service Operation No. 14. Changing the Discharge Valve:

a. Close valve No. 1 and operate compressor to lowest possible back pressure.

b. Stop compressor and immediately close valve No. 2.

c. Open valves Nos. 6 and 7 allowing pressure from cylinder head to by-pass into crank-case. Usually the pressure in the cylinder head is just sufficient to break the vacuum on the crankcase, thereby making it unnecessary to lose any large quantity of refrigerant into the atmosphere.

d. If the pressure on both gauges is above 0 lb., close valves Nos. 6 and 7, as this pressure will have to be relieved to the atmosphere.

e. If the pressure in the crankcase is below 0 lb., crack valve No. 2 slightly allowing the pressure to increase to 0 lb. Then close valves No. 2, 6, and 7.

f. Unbolt valve No. 2, leaving it attached to the condenser line and move it to one side.

g. Unbolt cylinder head and remove cylinder head and discharge valve. Inspect piston valve while accessible and replace if needed.

h. Clean and oil gasket surfaces, and install new discharge valve, using new gaskets at each joint. Bolt cylinder head and discharge valve back into place.

i. Reinstall valve No. 2.

j. Open valve No. 7 and uncap service connection No. 8.

k. Crack valve No. 1 and pressure will purge out through service connection No. 8. Close valve No. 7.

l. Test for leaks with pressure from low side being admitted through valve No. 1. Then open valve No. 2 and again test for leaks.

m. Open valve No. 1 and put system into operation.

Service Operation No. 15. Changing the Compressor Body:

a. Proceed as in operation 14, through steps a, b, c, d, e, and f.

b. Unbolt valve No. 1, leaving it attached to the suction line.

c. Disconnect low pressure control line.

d. Unbolt compressor body from base and remove.

e. Install new compressor body.

f. Reinstall valves Nos. 1 and 2 using new gaskets and reconnect low pressure control line.

g. Proceed as in steps "J," "K," "L," and "M" in operation 14.

Service Operation No. 16. Changing Liquid Line Filter at Valve No. 3:

a. Close valve No. 3.

b. Evacuate liquid line. Operation No. 1.

c. Close valve No. 4.

d. Remove filter and replace with new one.

e. Purge liquid line. Operation No. 3.

f. Test for leaks. Operation No. 5.

g. Open valves Nos. 3 and 4, and put compressor into operation.

Service Operation No. 17. Changing Liquid Line Filter Outside Valve No. 4:

a. Evacuate liquid line. Operation No. 1.

b. If filter is completely clogged, it will be impossible to evacuate the liquid line. If the system is so located that it will do no harm to allow the refrigerant contained in liquid line to escape into air, close valve No. 4. Disconnect liquid line at valve No. 3, and let refrigerant escape. Then replace filter and proceed as in operation No. 16, steps "E," "F," and "G."

c. If liquid cannot be exhaused into air, install pinch-off block on liquid line, about 6 in. this side of clogged filter. (The use of the pinch-off block is described in Installation Operation No. 9.)

d. With pinch-off block installed and tightened, close valve No. 4, and remove filter, replacing with new one.

e. With new filter installed, open valve No. 4. Remove pinch from line as in step 6, Installation Operation No. 9.

f. Evacuate liquid line. Then with valves Nos. 3 and 4 closed, disconnect liquid line from filter and re-flare it just this side of the pinch, to remove pinched portion from tube.

g. If line is then long enough, reconnect it to filter, if not, install a fitting and a short piece of tubing to lengthen line and connect to filter.

h. Purge liquid line.

i. Test for leaks.

j. Open valves Nos. 3 and 4 and put system into operation.

Type 1A Flooded System

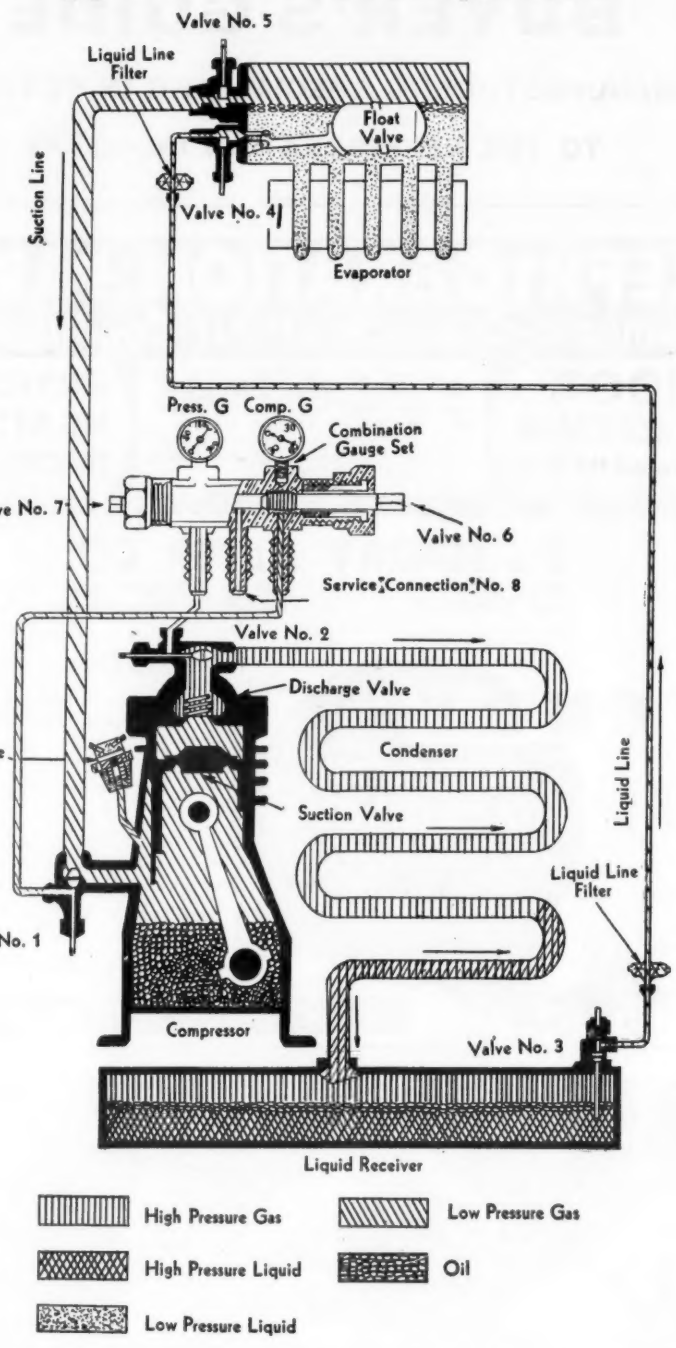

Fig. 135—Type 1A flooded system using low side float valve, low pressure control, and having two evaporator service valves (No. 4 and No. 5). Common service operations on this type of flooded system are described in this issue.

First 6 Chapters of Master Service Manual Now Available in 112-page Booklet

Published in this issue is Chapter 9, Instalment 5 ("Service of Refrigerators") of the Master Service Manual, prepared by K. M. Newcum. The manual is being published serially in Electric Refrigeration News, the first instalment appearing in the April 10, 1935, issue. When all the chapters have been published in the News, the information will be put in book form, with considerable supplementary material.

This manual of information on the design and operation of present-day refrigeration systems will add to the service man's knowledge, and will assist him in meeting specific problems in servicing operations in the field.

Our supply of some of the back issues has been sold out. In order to meet the demand for the complete series we make the following offers to service men:

(1) Send $3.00 for a year's subscription to Electric Refrigeration News to start Aug. 28, 1935, and we will send reprints of all previous Newcum articles (the first six chapters of the book) in pamphlet form (size 6¼x8¾ inches).

(2) Send your advance order for a copy of the Master Service Manual, enclosing $3.00 to pay for the complete book, when published, and we will send you free of charge, reprints of all the Newcum articles published in the News up to and including Aug. 21, 1935. These reprints are in pamphlet form size 6¼x8¾ inches).

Following is an outline of the subjects and the dates of the weekly issues of Electric Refrigeration News in which the material was published:

Chapter 1—THEORY OF REFRIGERATION (April 10).

Chapter 2—PRINCIPLES OF MECHANICAL REFRIGERATION (April 17).

Chapter 3—COMMON REFRIGERANTS (April 24).

Chapter 4—CONDENSING UNITS.

Instalment 1: description of various compressor parts (May 1).

Instalment 2: stuffing box seals, flywheels, and direct-connected units (May 8).

Instalment 3: rotary compressors (May 29).

Instalment 4: care and servicing of shut-off valves and gaskets (June 5).

Instalment 5: condensers (June 12).

Instalment 6: liquid receivers (June 19).

Chapter 5—EVAPORATORS.

Instalment 1: flooded evaporators with low side float valve (June 26).

Instalment 2: high side float valves and flooded evaporators (July 3).

Instalment 3: automatic expansion valves (July 10).

Instalment 4: automatic expansion valves —continued (July 17).

Instalment 5: thermostatic expansion valves (July 24).

Chapter 6—CONTROLS.

Instalment 1: low pressure controls (July 31).

Instalment 2: low pressure controls—continued (Aug. 7).

Instalment 3: thermostatic controls (Aug. 14).

Instalment 4: thermostatic controls—continued (Aug. 21).

Chapter 7—MOTORS.

Instalment 1: repulsion start-induction run motors (Aug. 28).

Instalment 2: repulsion start-induction run motors (continued) and capacitor motors (Sept. 4).

Instalment 3: direct current motors and belts (Sept. 11).

Chapter 8—INSTALLATION

Instalment 1: installation of refrigerators (Sept. 18).

Instalment 2: correct use of fittings in making joints (Sept. 25).

Chapter 9—SERVICE.

Instalment 1: classification of systems and use of combination gauge set (Oct. 16).

Instalment 2: service complaints and remedies on Type 1A flooded systems (Oct. 23).

Instalment 3: service complaints and remedies on Type 1A flooded systems —continued (Oct. 30).

Instalment 4: service operations on type 1A flooded systems (Nov. 6).

Instalment 5: service operations on type 1A flooded systems—continued (Nov. 13).

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ELECTRIC REFRIGERATION NEWS

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THREE DOLLARS PER YEAR
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Retail Sales in Philadelphia Up 12% for 9 Mo.

43,237 Units Sold Through September; $180 Is Average Price

PHILADELPHIA—Sales of household electric refrigerators in the metropolitan area by members of the Electrical Association of Philadelphia for the first nine months of this year totaled 43,237 units, an increase of 12 per cent over the first nine months of 1934.

Dollar volume of the units sold in the Philadelphia area for the first three-quarters of the year amounts to $7,791,380, as compared with $7,345,795 for the same period last year, a 6 per cent increase.

Average unit retail price of refrigerators sold in this period dropped to $180 this year, from an average price of $190 for those units sold in the three-quarters period of 1934.

The report covers sales in Philadelphia, Bucks, Montgomery, Delaware, and Chester counties. It covers all makes sold in this territory except the following: Bohn, Buckeye, Merchant & Evans, Puritan, Wurlitzer, and Zerozone.

Evidence of a successful late summer sales drive by distributors and dealers is embodied in the month-by-month report, as practically all the gain over 1934 was consummated in the months of July, August, and September. Only a very slight increase had been recorded at the end of the first six months.

July sales of 6,290 units recorded a particularly impressive gain over previous years.

Figures on the average price of the refrigerators sold each month show a distinct trend towards higher-priced units in the late summer and early fall. For example, from March through June of this year the average price of refrigerators sold in these months stayed at around $176; by September it had climbed to $193.

A separate tabulation of the sales of electric refrigerators made by the Philadelphia Electric Co., local utility, shows that the power company retailed 3,893 units in the first six

(*Concluded on Page 2, Column 3*)

Celotex Completes Reorganization

CHICAGO—Reorganization of Celotex was completed Nov. 6 when the business and properties of the old company were taken over by the new company, The Celotex Corp.

The reorganization was consummated under the plan approved by a majority of stockholders, security holders and creditors, and confirmed by Judge John P. Nields in the Delaware United States district court. Celotex is one of the first large companies to be reorganized under section 77-B.

Directors of the new corporation are W. W. Colpitts, E. J. Costigan, B. G. Dahlberg, John G. Getz, Jr., Wallace Groves, Walter S. Mack, Jr., James W. Marshall, C. G. Muench, T. B. Munroe, W. B. Nichols, and Henry A. Verdelin.

The executive committee is composed of Groves, chairman, Colpitts, Dahlberg, Getz, Mack, and Munroe.

Dahlberg is president; Munroe and Muench, vice presidents; C. G. Rhodes, secretary; and W. W. Rogerson, treasurer.

"There will be no change in the fundamental Celotex merchandising policy toward its dealers," declares President Dahlberg. "We feel, just as we did when Celotex was founded, that our job is not finished when our products are delivered to the dealers, but only when they are sold to the ultimate consumer.

"With a readjusted capital structure and a sound financial setup, the company is in a position to expand its merchandising organization, its advertising, its sales promotion activities, and its plant facilities to make the most of every advance in general business.

"Celotex sales have mounted steadily this year, reflecting the advances in other industries in which the company's products are being used more and more extensively."

G-E Consolidates Appliance Sales Departments

CLEVELAND—The specialty appliance department and the merchandise department of General Electric Co. have been consolidated into the "appliance and merchandise department," reports C. E. Wilson, G-E vice president.

Wilson now has general supervision over all of the company's appliance activities, including factory, engineering and sales. The new department will have four sales divisions, with P. B. Zimmerman, formerly manager of the specialty appliance department, as general manager of appliance sales.

The following sales divisions, with their commodity responsibility, are set up under Zimmerman:

Specialty Appliance Sales division, G. J. Chapman, Cleveland, manager; A. M. Sweeney, sales manager; G-E refrigerators and Hotpoint refrigerators, household and commercial; ranges, dishwashers, kitchens, water heaters, workshops, and kitchen waste units.

Radio Sales division, R. J. Cordiner, Bridgeport, Conn., manager; radios.

Home Laundry Equipment and Cleaner Sales division, D. C. Spooner, Jr., Bridgeport, manager; G-E and Hotpoint home laundry equipment, cleaners.

Traffic Appliance Sales division, R. W. Turnbull, Bridgeport, manager; fans, sunlamps, clocks, and G-E Hotpoint heating devices.

American Steel Export Handles Zerozone in Foreign Markets

DETROIT—American Steel Export Co., Inc., New York City, has been appointed export sales agent for Zerozone Refrigeration Co.'s household and commercial refrigeration equipment, it was learned last week.

The organization, which is exclusive export agent for Philco radios, has 15,000 dealers in 178 foreign countries, and during the last 60 days has shipped Zerozone household units to 18 countries, officials of Zerozone Co. report.

Carter Is Transferred to Direct Sales Division of Kelvinator Corp.

DETROIT—Donald Carter has been appointed to the factory office of the national direct sales division of Kelvinator Corp., states Edward R. Legg, manager of the division.

Carter will have charge of the national user business detail, and will act as an office manager in conjunction with Harold Priest, assistant manager of the division. Previous to this appointment, he spent two years in the order and distribution department, and four years in the Kelvinator shipping division.

Directs Specialty Sales

G. J. CHAPMAN
Manager of the specialty appliance sales division under the new G-E setup.

Jobbers Request Cooperation of Makers of Parts

Wholesalers Will Meet With Manufacturers In December

DETROIT—National Refrigeration Supply Jobbers Association, in a letter to parts manufacturers, has asked their cooperation in obtaining the names of reputable firms handling their products, who might be interested in joining the new organization.

A "mixed meeting" of jobbers and manufacturers is planned for the middle of December, at which mutual problems will be threshed out. At present, no definite time or place has been determined. Pittsburgh, Cleveland, Detroit, and Chicago are under consideration for the meeting.

The following letter to manufacturers, went out over the signature of J. M Oberc, jobbers' association secretary:

"Please refer to the article in ELECTRIC REFRIGERATION NEWS, Oct. 30, 1935, titled 'Refrigeration Supply Jobbers Organize,' for details in connection with the recently formed Refrigeration Supply Jobbers Association, which is of national interest.

"The organization is being formed for the mutual interests of the manufacturer, jobber, and refrigeration service engineer, or installer, and any cooperation or support you will lend it will be much appreciated.

"Will you kindly cooperate with us at this time by supplying the undersigned with a complete list of jobbers handling your products in the United States. This is for confidential use. In supplying this list of names and addresses you will evidence your willingness to cooperate with reputable jobbers, whose efforts are to render adequate representation in the sale of your products in an assigned territory.

"At your request, we shall be glad to send you a printed copy of the Constitution and By-Laws."

In a general bulletin, being sent this week to all jobbers on the association's list, the "mixed meeting" of jobbers and manufacturers is announced, and firms are asked to send in their membership applications before Nov. 25 so they may be passed on before the next meeting.

Realizing that in the rush of organization its jobber list may be incomplete, the association has asked its members to check with firms in their territory who might be eligible for membership.

Special membership rates of $10, for those who attended the Detroit meeting last month, and $15, for those who did not attend, have been established by the association for all firms who become members before Dec. 31, 1935. After that time, the regular fee of $25 will apply. Annual dues are $12.

Application for membership must be accompanied by check, payable to H. W. Blythe, treasurer of the organization, and must be mailed to 1203 Stanley Ave., Detroit.

General Sales Manager

P. B. ZIMMERMAN
General manager of all G-E appliance sales following coordination move.

New York to Hold Code Hearing Dec. 5

NEW YORK CITY—Hearing on the proposed code of the City of New York relating to refrigerating systems has been scheduled for 10 a.m. Thursday, Dec. 5, in room 1124, Municipal building, New York City, according to official notices just released.

The final draft of the proposed code places drastic restrictions on installers of refrigerating and air-conditioning systems.

Text of the code in its latest revised form was published in the Nov. 13 issue of ELECTRIC REFRIGERATION NEWS.

Standards for Rating and Testing Air Conditioners In This & Next Issue

On pages 12, 13, and 16 of this issue are published the first part of the complete text of the "Standard Methods for Rating and Testing Air Conditioning Equipment" which were recently given the approval of the Air Conditioning Manufacturers Association, the Refrigeration Division of National Electrical Manufacturers Association, and the Refrigerating Machinery Association.

These standards, first of their kind, not only provide a basis for the comparison of performance among various types and makes of air-conditioning equipment, but they also serve to define, in standard terms, the various functions of air-conditioning equipment.

The rating and testing standards should prove of value to manufacturers, distributors, and purchasers of air conditioners.

Second and concluding part of the complete text of these standards will be published in the next (Nov. 27) issue of ELECTRIC REFRIGERATION NEWS.

In the issues of Nov. 6 and 13 were published the "Standard Methods for Testing Mechanical Condensing Units" recently approved by the Refrigeration Division of National Electrical Manufacturers Association and the Refrigerating Machinery Association.

Extra copies of these issues are available at 10 cents each, or the entire set of November issues containing the rating and test methods for 40 cents.

New REA Projects Will Serve 4,000 Farmers

WASHINGTON, D. C.—Final approval of four more projects to take central station electricity into rural areas not heretofore served has been announced by Rural Electrification Administration. The projects are in four states, and call for construction of more than 800 miles of line, to serve more than 4,000 new farm customers.

Loan contracts signed with the various sponsoring organizations call for construction in Shelby County, Ohio; Meigs County, Tennessee; Monroe County, Mississippi; and 22 counties in South Carolina.

Approval of these projects brings the total number of miles of rural line financed by REA up to 1,940, and the number of farm families served to over 8,000. (Approval of seven previous projects was reported in ELECTRIC REFRIGERATION NEWS, Nov. 13). The 11 projects involve loans amounting to $2,339,612.

Largest of the projects, and the first loan contract to be made with a state electrification authority, calls for 511 miles of rural line in the 22 South Carolina counties. This contract, for $542,328, will bring central station electricity to 2,128 farm families now without it.

The South Carolina Electrification Authority, including elective state officials and the presidents of four leading colleges, will operate and maintain the lines after completion of the construction work.

Counties to be served are Darlington, Kershaw, Lee, Marlboro, Sumter, Anderson, Greenville, Oconee, Pickens, Spartanburg, York, Bamberg, Hampton, Jasper, Calhoun, Fairfield, Lexington, Beaufort, Orangeburg, Dillon, Chester, and Richland.

Power for the new lines will be paid for at an average wholesale rate of

(*Concluded on Page 2, Column 4*)

Truscon to Sell Copeland's 1936 Household Line

Present Distributors of Both Firms Will Constitute Sales Organization

DETROIT—Under terms of an affiliation effective Dec. 1, Truscon Steel Corp. will take over the sales of Copeland household electric refrigerators in the United States, through its own and the existing Copeland distributing organization.

The agreement with Truscon applies only to sales of household units, Copeland officials pointed out in making the announcement. Copeland will continue to manufacture the units, as always, and will handle all export household sales as well as world sales of commercial units.

Truscon's sales headquarters will be in Detroit, at 615 Wayne St. All of the company's advertising and sales promotional activities will be handled from this point.

H. L. Weisburgh is sales manager of Truscon's refrigeration division, H. G. Doering will have charge of advertising, and E. C. Reiner will be office manager of the organization. Also active in the company's refrigeration activities will be Harry Woodhead, general manager of Truscon's Cleveland plant, and L. E. Waggoner, treasurer of the Truscon organization.

Mr. Weisburgh during 1933 and part of 1934 was in charge of household refrigerator sales for Universal Cooler Corp., going from there to Truscon. Previously he had been connected with the sales department of Zerozone Refrigeration Co.

Under the new arrangement, distribution of Copeland household products will be through the same type of channel as Truscon has used in the past, Mr. Weisburgh said. This includes major wholesale and retail outlets.

Truscon at present has 15 field sales representatives, contacting distributing outlets in all parts of the country.

While complete details are not ready for announcement, it is known that Copeland's 1936 models will feature a modification of the twin-cylinder compressor which the company has been making for the past two years.

The compressor features improvements in twin-cylinder design, Copeland engineers say, including simplified valve construction, positive lubrication, suction and discharge connections in head, and balanced seal.

Only 8¾ in. high, it lends itself to installation in either top or bottom mounted compartments. Unit assembly is floated on four combination rubber-spring mountings, and circulation is provided in the unit compartment by

(*Concluded on Page 2, Column 3*)

Cleveland League Closes Exhibit as Survey Shows Displays Are Plentiful

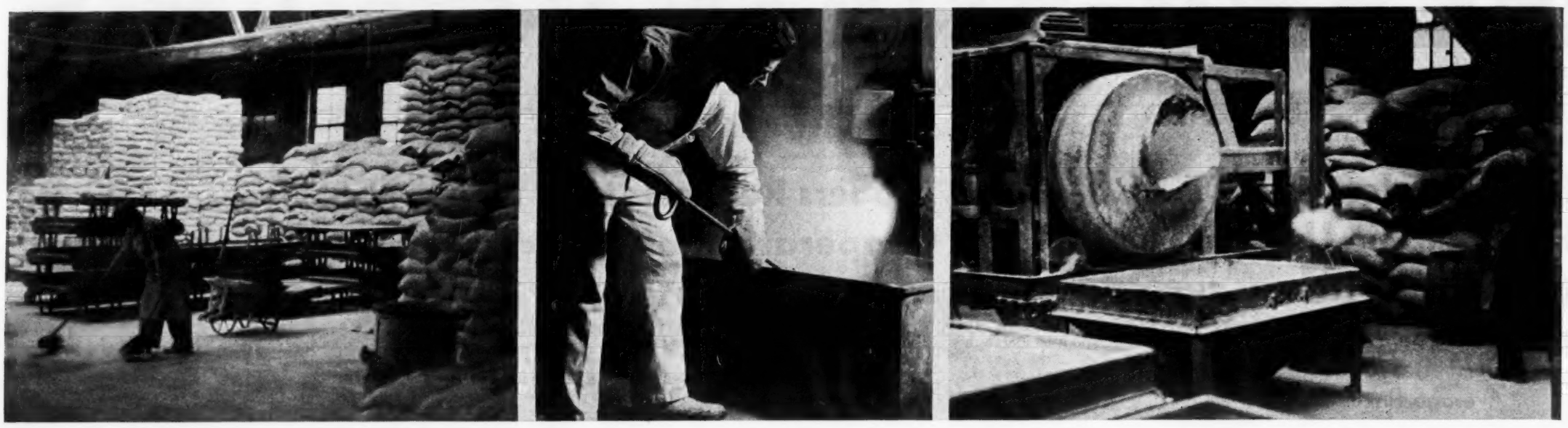
CLEVELAND—Electric League of Cleveland has discontinued its permanent exhibit of electrical household appliances in the belief that the many dealerships throughout the city, 248 of which feature electric refrigerators, can well supply the need for displays.

The exhibit was established in 1925, when it offered the consumer the only opportunity there was to see and compare competitive products. Now several Cleveland stores run electrical appliance displays almost as large and complete as the Exhibit itself.

In comparison with the handful of dealers back in 1925, 756 stores now sell electrical appliances in the Cleveland metropolitan area. In addition to the 248 stores selling electric refrigerators, there are 251 selling clothes washers; 257 selling electric percolators, 224 selling radio sets, 359 selling toasters, and 30 selling electric ranges.

In the future, the League will concentrate on helping to increase sales at the point of sale. It will emphasize especially the actual demonstration of appliances in stores and homes; home surveys leading to direct sales of lighting equipment and indirect sales of appliances; cooperative advertising assistance; window display cooperation; and other similar promotional activities.

Cleanliness and Economy Stressed in Chicago Vitreous Enamel Plant



Cleanliness and a disinclination to waste anything which may be of value are two characteristics of Chicago Vitreous Enamel Product Co. operation, as these three pictures, taken in the plant proper, indicate. (1) A workman salvages material from the floor. Piled high around him are sacks of materials used in the process of manufacturing enamel. (2) Stirring up a "mix" in one of the large vats. (3) Another view in the plant, near one of the big mixers. The white splotch in mid-air is frit, which the workman is tossing into the hopper.

Court Names Brennan Receiver of National Refrigeration Corp.

DAYTON—Charles E. Brennan has been appointed receiver of the assets and effects of National Refrigeration Corp. by the common pleas court of Montgomery County, Ohio, it was announced last week.

All the assets of the defunct company will be sold, and the receiver will accept sealed bids for them up to 10 a. m., Nov. 22, at his office, 300 L. T. Cooper Bldg., here. All sales will be for cash, and any and all bids may be rejected by the receiver.

Bids may cover purchase of the entire assets, or any part of them.

All creditors of National Refrigeration Corp. are asked to file proof of their itemized claims against the company before Dec. 16.

Sylvester Joins Geyer, Cornell & Newell as Account Chief

NEW YORK CITY—Elmer L. Sylvester, sales manager of the heating and winter air-conditioning division of the Delco Appliance Corp., Rochester, N. Y., has joined the organization of Geyer, Cornell and Newell, Inc., New York advertising agency, as account executive.

In his work as sales manager for the Delco-Heat division of the Delco Appliance Corp., Mr. Sylvester was charged with responsibility for developing a distribution and merchandising program for a complete line of automatic heating and winter air-conditioning products.

Before association with Delco, Mr. Sylvester was connected with its predecessor, North End Electric Co.

Total Sales by Members of Philadelphia Association

Month	1935 Units Sold	1934 Units Sold	1933 Units Sold	1935 % Inc. or Decrease over 1934	1935 Retail Value	1934 Retail Value	% Inc. or Decrease over 1934	1935 Av. Price	1934 Av. Price
January	718	1,069	1,033	—33%	$ 137,558	$ 203,405	—32%	$191	$190
February ..	2,634	1,329	1,107	+98%	488,499	247,586	+97%	185	186
March	6,357	3,363	2,072	+89%	1,115,435	628,204	+77%	175	186
April	6,652	8,290	4,621	—20%	1,176,956	1,570,483	—26%	177	189
May	7,885	8,754	7,973	—10%	1,390,673	1,659,337	—17%	176	189
June	5,936	6,738	11,399	—12%	1,037,659	1,255,421	—18%	175	186
July	6,290	4,775	4,553	+31%	1,147,967	929,799	+23%	182	194
August	4,035	2,683	4,384	+50%	754,558	526,199	+43%	187	196
September .	2,730	1,593	2,823	+71%	742,075	325,361	+66%	198	204
Total	43,237	38,594	39,965	+12%	$7,791,380	$7,345,795	+ 6%	$180	$190

Sales of Refrigerators by Philadelphia Power Co.

Month	1935 Units Sold	1934 Units Sold	1933 Units Sold	1935 % Inc. or Decrease over 1934	1935 Retail Value	1934 Retail Value	% Inc. or Decrease over 1934	1935 Av. Price	1934 Av. Price
January	53	117	60	—55%	$ 10,923	$ 26,042	—58%	$206	$222
February ..	104	103	134	+0.9%	18,383	22,038	—17%	176	214
March	302	231	142	+30%	57,386	47,374	+21%	190	205
April	566	726	394	—23%	105,182	144,457	—28%	186	198
May	719	795	652	—10%	130,465	159,536	—19%	181	200
June	715	589	948	+21%	134,389	125,521	+7%	188	213
July	658	554	668	+19%	133,640	118,355	+12%	202	213
August	513	353	657	+45%	102,322	76,551	+33%	199	216
September ..	263	184	461	+43%	52,649	37,928	+38%	200	209
Total	3,893	3,652	4,116	+6%	$ 745,340	$ 757,802	—2%	$192	$207

Note: Utility sales approximate 9 per cent of total sales.
Report covers sales in Philadelphia, Bucks, Montgomery, Delaware, and Chester Counties. Report does not include sales of the following makes, all of which either are now or have been sold in the Metropolitan Philadelphia area: Bohn, Buckeye, Merchant & Evans, Puritan, Wurlitzer, Zerozone.

Copeland Household Refrigerators to Be Sold by Truscon

(Concluded from Page 1, Column 5)

the use of a suction fan type flywheel.

A novel method of oiling is claimed, with a minimum amount of oil in the crankcase, so that oil slugging is prevented and positive lubrication of pistons and pins is obtained.

The unit, known as Model C, comes in ⅛ and ⅙-hp. sizes. It has a bore of 1¼ in., and a stroke of 1⅛ in. The larger unit is driven at 490 r.p.m., and the smaller at 420 r.p.m. Ice melting effect of the larger unit is 138 lbs. per 24 hours; of the smaller, 115 lbs.

Condenser on both units is of the finned tube type.

Overall dimensions of the units are: height, 10¾ in., width, 20⅜ in., and depth, 12⅞ in. Other specifications are:

Model No.	C-16	C-20
Motor (hp.)	⅛	⅙
Bore (in.)	1¼	1¼
Stroke (in.)	1⅛	1⅛
Cylinders	2	2
R.p.m.	420	490
I.M.E. per 24 hrs. (lbs.)	115	138
Liquid line (in. S.A.E.)	¼	¼
Suction line (in. S.A.E.)	⅜	⅜
Height (in.)	10¾	10¾
Width (in.)	20⅜	20⅜
Depth (in.)	12⅞	12⅞
Compressor height (in.)	8¾	8¾
Weight (lbs.)	76	77
Condenser	Finned tube	
Drive	V-belt	
Mounting	Spring-rubber	

Philadelphia 9 Mos. Sales Increase 12%

(Concluded from Page 1, Column 1)

months of 1935, as compared with 3,652 units in the similar 1934 period, an increase of 6 per cent.

Sales by the utility were 9 per cent of the total sales made.

Average price of the refrigerators sold in the first three-quarters of the current year dropped to $192 from an average price of $207 for the same period in 1934.

At the left are the tabulations of sales by the Electrical Association members, and the utility's sales.

4 More Power Projects Approved by REA

(Concluded from Page 1, Column 4)

1¼ cents per kwh., and the proposed resale is $4.65 for the first 100 kwh. used each month. With 100 kwh., it is possible to light a house, pump water to an inside bathroom and a kitchen sink, run a refrigerator, and operate a radio, a toaster, a washer, and an iron.

REA's loan of $350,000 to the Shelby County (Ohio) Rural Electric Cooperative, Inc., calls for construction of 270 miles of rural line, to serve 1,005 farms which, to the present, have been without electricity. The county has many livestock, dairy, and general farms, most of which are 100 acres or less. Twenty-one per cent of the farms in the area have their own individual lighting plants.

The Shelby County cooperative is sponsored by the Farm Bureau Rural Electrification Cooperative, Inc., a state-wide organization, which will supervise construction of the lines, maintain them, furnish billing and collection service, and generally manage the undertaking, at a rate of 2½ mills per kwh.

The transmission and distribution lines of the Shelby County project and those of the Miami County (Ohio) project, announced last week, are interconnected, so that the two may be operated as a unit, although they will be individualiy owned and managed.

Monroe County (Mississippi) Electric Power Association has borrowed $81,000, to build 55.3 miles of rural lines, serving 361 rural homes; and Meigs County (Tennessee) Electric Membership Corp. has arranged a loan of $92,200, to build 78.6 miles of lines, serving 545 families.

The last two projects are in the TVA area, and will be supplied with TVA power. Standard TVA rates will apply, plus a surcharge of 1 cent a kwh. on the first 100 hours, for amortization of the REA loan. Customers in these areas will pay $3.50 for the first 100 kwh. of electricity used each month.

McCord Official Dies At Football Game

DETROIT—Frederick W. Hicks, plant manager of McCord Radiator & Mfg. Co. since 1919, died of a heart attack here Sunday afternoon. He was 56 years old.

Mr. Hicks was stricken while watching the Detroit Lions-Green Bay Packers professional football game, and died while being taken to Redford branch of Receiving Hospital.

'Sweepstakes Sale' Has Gambling Motif

DENVER—Add to your list of business-getting ideas this "Sweepstakes Sale," recently conducted by Joslin's, large Denver department store.

The "race track" theme lent itself to illustrative and advertising treatment that caught the public fancy. Top border, for window displays and advertisements, might have been sketched at any of the country's leading tracks.

Featured merchandise was introduced by drawings of racing thoroughbreds, and buyers were urged to "bet to win," "bet to place," or "bet to show," on these items. The sale was a store-wide event.

Near the sale's close, these "winners" were replaced by "also rans," the illustrative sketches changing from sleek sprinters to broken-down nags. In this latter classification, the store offered a couple of used electric refrigerators, in good condition, atractively priced.

Distributor in Phoenix Tells How All Dealers Cracked 1935 Quota

PHŒNIX, Ariz.—Promotion of customer satisfaction, sponsorship of dealer education, and use of extensive advertising, are the principal factors which have enabled E ectrical Equipment Co., Kelvinator distributor with headquarters here, to complete its best year since it took on the Kelvinator franchise in 1924, declares Sam Kahan, general manager.

"If we did not have satisfied users to whom we have given prompt service, throughout our territory, we would never have been able to increase our business each year," said Kahan. "Our customers have enabled us to sign the strongest refrigerator dealers in the towns we cover."

All dealers selling for Electrical Equipment Co. comp'eted the 1935 fiscal year with more than 100 per cent of sales index quota; most of them attained this record by May 31.

He reports the following dealer records: Phœnix, 123 per cent of quota; City Ice & Fuel Co., Kingman, 700 per cent; Goodwin Indian Store, Tempe (serving a population of only 2,495) 400 per cent; Foxworth-Galbraith Lumber Co., Superior, 450 per cent.

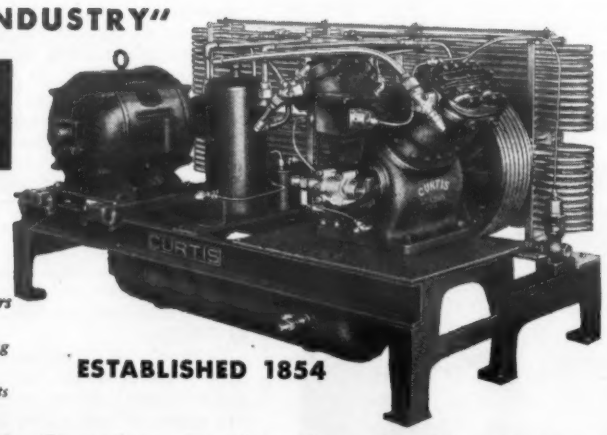
To keep dealers' sales forces acquainted with product changes, new developments, and sales plans, Leon S. Black, who has been with Electrical Equipment Co. for 11 years, contacts all outlets in the territory covering a radius of 300 miles. Black conducts evening meetings with dealers.

"Our advertising is a regular feature of the local radio station which has coverage throughout the state," says M. C. Jennings, assistant general manager. "We also advertise in the Phoenix newspapers."

"AN OLD NAME IN A YOUNG INDUSTRY"

CURTIS

A Complete Line—59 Units
Fair Policy—81 Years' Successful Merchandising
Quality Workmanship—41 Years' Building Compressors
Financial Stability—AaA1 Highest Capital & Credit Rating
Proven Design—13 Years' Building Refrigeration Units



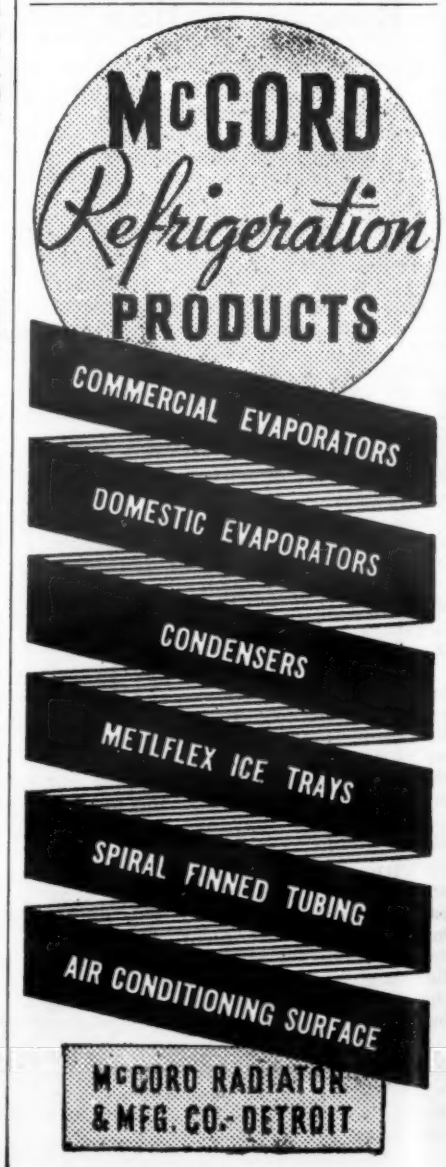
ESTABLISHED 1854

Only by Building Permanently on This Complete Combination Can You Secure Sure Profits in This Fast Growing Industry—

←Air View of Curtis 20 Acre Plant

Curtis is a well integrated institution, having its own gray iron foundry, brass foundry, machine shop, pattern shop, tool room, electric welding department, structural shop and power plant.

CURTIS REFRIGERATING MACHINE CO.
Division of Curtis Manufacturing Co.
1912 KIENLEN AVENUE • ST. LOUIS, MISSOURI



Milwaukee Retailers Urge Employers to Curb 'Group Buying'

MILWAUKEE—In an effort to stop the "group buying" of electric refrigerators, appliances, fuel, groceries, and other products by large industrial concerns at wholesale prices, for the benefit of employees, the Milwaukee Association of Commerce is sending a letter to all executives of Milwaukee plants, calling attention to the danger of the practice, as it affects the small business man.

The movement to curb the "group buying" habit, which has been making large inroads into retail business during the last few months, was begun by the Wisconsin Radio, Refrigeration, and Appliance Association. Later the following organizations joined in the campaign:

Fuel Merchants Association of Milwaukee, Milwaukee Retail Grocers Association, Wisconsin Retail Hardware Association, Milwaukee Retail Furniture Association, and The Electrical League of Milwaukee.

Educate Industrial Concerns

Education of industrial companies as to the dangers inherent in the practice, it was felt, would prove the most effective method of slowing it up, and eventually stopping it altogether.

With this in mind, the following letter was sent by the retail division of the Association of Commerce:

"Investigation by the retail committee of this Association and other retail trade groups in Milwaukee has revealed an unfair practice which has worked considerable hardship on the smaller merchants in this community.

Buy Below Retail Price

"During the past several years, there has been an alarming increase in the practice of employees of our larger industrial plants to purchase a variety of merchandise including radios, musical instruments, tires, refrigerators, furniture, and household goods through their employers from wholesalers and distributors, at prices considerably below the prevailing retail market.

"Investigation has revealed that purchasing departments of many of our industrial plants are acting as agents for the employee in the purchase of merchandise at 'wholesale.'

"The growth of this practice has been so rapid and in such volume that it threatens the welfare of many of our smaller retailers, whose livelihood depends entirely upon the purchases of employees of our industrial plants.

Important Function of Retailer

"The retailer performs an important and necessary function in the field of distribution, and ought to be protected against unfair competition of this character, with which he is unable to cope.

"In addressing this letter to your company, the committee does so in the hope that you will investigate to determine whether or not this practice is being pursued in your plant, and, if so, to cooperate with retail members of this Association to the end that the abuse may be eliminated."

Kelvinator Will Spend $500,000 on 2 Plants

ATLANTA—Expenditure of more than $500,000 on the expansion of factory facilities at Grand Rapids and Detroit is part of the Kelvinator 1936 program which H. W. Burritt, vice president in charge of sales, explained when he outlined a proposed two-months sales campaign to Kelvinator distributors and their representatives at a meeting held at the Hotel Biltmore here recently.

Burritt said that the Kelvinator 1935 fiscal year showed a larger sales volume than that made in 1934.

Walter Jeffrey, domestic advertising and sales promotion manager of Kelvinator Corp., also attended the meeting held here.

S. C. Greusel, Milwaukee Appliance Veteran, Dies

MILWAUKEE—Sylvester C. Greusel, for many years associated with the electrical appliance business in this city, died at St. Mary's hospital here on Nov. 9. He was 60 years old.

Mr. Greusel was born in Detroit, and came to Milwaukee in 1920, where he entered the appliance business with his brother Frank W. Greusel, and Perry R. Boole, forming the G-Q Electric Co. to distribute electrical supplies at wholesale.

Later, the G-Q Co. was taken over by General Electric Supply Corp., and Mr. Greusel remained as local operating manager.

Surviving him are his widow, a son, Howard, and his brother, Frank Greusel, president of Maurer-Greusel Co., Milwaukee Grunow distributor.

Sidewalk Booth Made With Awnings Is Prospect Getter

NASHVILLE, Tenn.—A novel plan to attract "sidewalk business" has proved a real sales-getter for the Earl Hyde Co. here.

Earl Hyde, owner, and R. L. Murray, general sales manager, figured there was plenty of business to be had from the people who passed by the establishment. Here's how they went about getting it:

A booth was built on the sidewalk adjoining the store. Made of awning cloth, it was constructed so as to be open on all sides during fair weather. Each day, four special refrigerator models, specially priced, were put on display under the canopy, to attract the attention of casual pedestrians who were prospective buyers.

In the booth, besides the four refrigerators featured daily, was a cut-away unit, with all working parts revealed for demonstration purposes.

Demonstrations were made at all hours to "chance customers"—the wives of company salesmen often being called in to act as pseudo-prospects, on the theory that the average person passing on the street would stop to investigate what was going on.

The method worked. Quite a few sales were made on the spot, and others were made later, to prospects gathered from passers-by who stopped in to listen.

Prize-Winning Utility Salesmen Honored At Banquet

PLATTSBURG, N. Y.—Presentation of a super-deluxe model Kelvinator electric refrigerator to James Lyons, salesman for the New York State Electric & Gas Corp.'s local office, was made recently at a banquet given in his honor by the Graybar Electric Co., Inc., Kelvinator distributor with headquarters at Syracuse.

Mr. Lyons sold 68 Kelvinators in this town of 7,000 people to become the leading utility salesman in the "Jubilee Load Builders" contest of the Associated Gas & Electric System of which the New York State Electric & Gas Corp. is a part. The award was offered by H. W. Burritt, vice president in charge of sales of Kelvinator Corp., Detroit.

Other leading Kelvinator-selling salesmen in the contest were: Eugene McCallion, C. W. Stephans, Inc., Staten Island, N. Y., who sold 47 units; J. J. Rauber, New York Central Electric Corp., Dansville, N. Y., 42 units; Walter Fox, Titus & Von Bulow, Kelvinator dealer at Easton, Pa., 37 units; and Roger Kennedy, New Hampshire Gas & Electric Co., Portsmouth, N. H., 35 units.

Officials of New York State Electric & Gas Corp. and of Graybar Electric Co. attending the banquet included Mr. Chapman, president, and I. E. Pierce, business manager of the Plattsburg division of the utility, and Fred G. Carson, merchandise manager of Graybar.

N. Y. Times Predicts Big '36 Appliance Sales Drive

NEW YORK CITY—A merchandising drive more pretentious than any previously attempted by the electrical appliance industry will form a part of the business building campaign of electrical manufacturers during the next year, reports the *New York Times* in its Nov. 10 issue.

The *Times* credits manufacturers of both major and smaller appliances as the source of its information.

"Companies producing refrigerators, electric ranges, washing machines, and dishwashing machines will concentrate on promotion of the electric kitchen," the article states. "In cooperation with the Federal Housing Administration, the manufacturers will take an active part in the model home exhibitions to be held in major cities of the country in the winter and spring.

"Manufacturers of smaller appliances will concentrate most of their effort on special promotion in retail stores through the year.

"The volume on appliances this fall has been comparable to that of 1929, and producers are convinced that by proper promotional effort they can maintain the sales levels indefinitely."

Williams Pays 50-Cent Dividend on Stock

BLOOMINGTON, Ill.—Williams Oil-O-Matic Heating Corp. has declared a dividend of 50 cents a share on its stock, payable to stockholders of record Nov. 19. This dividend is the first since May 16, 1927, when 37½ cents a share was paid.

Baltimore to Stage First Home Show

BALTIMORE—First National Home Show, sponsored by the Manufacturers' Housing Display Council to set before the public the opportunities offered by the provisions of the National Housing Act, will open here Jan. 4, 1936, at the Fifth Regiment Armory.

A complete five-room cottage, designed by William Gordon Beecher, A. I. A., and built under the direction of the building committee of the Baltimore Real Estate Board, is to be a feature of the show. The exterior of this house will embody the charm of typical Maryland architecture. The interior will be equipped with all modern building improvements.

"Talking towers," equipped with broadcasting apparatus to supply information concerning the single mortgage system, and the modernization credit plan of the FHA, are part of the show. Each tower contains two miniature model homes.

The FHA is supplying modern educational and display equipment for the show. Similar shows are to be held throughout the cities of the United States, where local real estate boards, better housing committees, and civic organizations will cooperate.

Aircraft Metal Co. Will Make Ranges, Insulation

COLUMBUS, Ohio—Plans for the construction of a $50,000 plant for the manufacture of stoves, ranges, and insulation, are being made by Aircraft Metal Co. of this city and Martins Ferry, reports B. C. Zuhar, general manager.

Approximately $30,000 worth of machinery and equipment will be installed and 100 workers will be employed.

HOUSEWIVES WILL GO FOR SAV-A-STEP

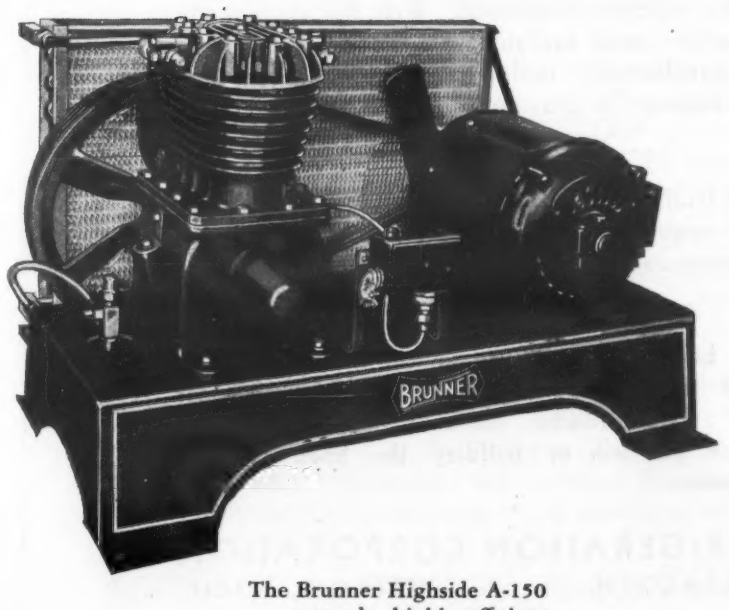
Biggest Refrigeration Sales Feature for 1936

STEWART-WARNER

STURDY as the Buffalo

● Much like the buffalos who once roamed the Western Plains and sturdily turned back attacks of man and beast alike, Brunner Refrigeration Units stand out today for their unfailing sturdiness in the face of modern refrigerating demands.

Each of the 8 Compressor models and 41 Highsides is a sturdy, compact, efficient unit designed and built to do its job—with an ample margin of capacity left over for the extra value that Brunner always gives... Units in Brunner's complete line range from 1/6 H.P. to 15 H.P.; air and water cooled, electric motor or gas engine driven. Free catalog, containing full descriptions sent on request. Brunner Manufacturing Co., Utica, N. Y., U. S. A.



The Brunner Highside A-150 . . . a sturdy, highly efficient unit; 1½ H.P.; air-cooled.

Brunner

A NAME BUILT BY 29 YEARS OF SERVICE

Westinghouse Tabulates Disadvantages of Old-Fashioned Refrigeration Methods For Food During Winter Months

MANSFIELD—To help salesmen convince prospects of the all-year-around value of an electric refrigerator, Westinghouse Electric & Mfg. Co. has tabulated a list of a refrigerator's advantages in economy of operation, food savings, protection of health, and convenience, as compared with the commonly-used types of winter food protection.

Mentioned among the "other" types of food protection for winter months are year-'round use of ice, part-time use of ice, icebox or container on back porch, window box, cellar, pantry, or closet.

Comparing an electric refrigerator to the year-'round use of ice, the Westinghouse chart says:

"Refrigeration costs with Westinghouse are usually 40 to 60 per cent less than with ice.

"Temperatures and interior arrangements in most ice boxes are not adequate to permit buying of large quantities of food at one time . . . The ordinary icebox is soon filled to overflowing, when you attempt to save all your leftovers, and also protect your original food supplies."

Of part-time use of ice, keeping the ice box in the kitchen:

"It's always summer in the kitchen. Irregular refrigeration does not afford complete protection . . . Where temperatures are apt to fluctuate, saving made by quantity buying may be lost by food spoilage or deterioration . . . you can't depend on nature for refrigeration . . . Where ice is bought irregularly, different places are usually used for storage of foods. Milk in one place, meat in another, vegetables and fruit somewhere else, makes housekeeping a chore.

"Irregular refrigeration makes it difficult to maintain adequate food supplies to entertain unexpected guests, or to extend greatest hospitality . . . You may need ice for an emergency sickness, or for unexpected guests, or for your family; perhaps at the time you want it most, there is none."

Of using icebox or other container in an exposed location:

"Nature provides adequate refrigeration only 19 days in the year . . . Foods exposed to the varying temperatures provided by nature are not safe. Sudden weather changes may freeze them until they are not palatable or usable, and sudden warmer weather may spoil them completely . . .

"Even if frozen milk were safe for children, melting is inconvenient, and the rich 'top cream' may be lost . . .

"With the Westinghouse in the kitchen, you save endless trips outside, in zero weather . . . Varying temperatures make it difficult to provide guests with pleasant surprises, and make it almost impossible to provide delicacies in advance, ready for serving.

"Nature is unreliable, when it comes to maintaining an ice supply. You can't depend on it. And if your porch icebox is cold enough to freeze ice, it's too cold for your food."

Of window boxes:

"Even if window boxes did provide adequate temperatures, their capacities are so limited that 'free' refrigeration by nature is really no economy . . . Foods are subjected to impurities of various kinds, beyond your control, even if partly covered.

"Space in window boxes is too limited for storage of large quantities of foods. And even if it were not, the fluctuating temperatures would make it unsafe, and unwise, to invest much money in foods, where protection is so doubtful.

"Unhealthy contamination may affect foods kept in window boxes or other exposed places . . . Frequent trips to cold porch from warm kitchen are dangerous."

Of the use of cellar, pantry, or closet, supposedly cold:

"Unpreventable ashes, soot, or other impurities make cellar food-keeping unsafe. Furnaces and heating devices frequently raise temperature beyond the safety zone, while unheated cellars or cold-rooms may be colder than safety permits.

"While cold cellars or pantries usually are capacious enough to store plenty of food, these perishables are subject to temperature variations . . . inconvenience of cold cellar or cold pantry tempts throwing out of foods which might otherwise be used in new form.

"Trips down the cellar steps consume time, trouble, and energy. They are harmful to many women . . . trips downstairs for butter or cream or cheese for the midnight snack or the bridge refreshments are unpleasant and annoying. And the cream might be sour."

Gambill Orders 10 Carloads Of Refrigerators & Coolers

CINCINNATI—Wheless Gambill, of the Gambill Distributing Co., Crosley distributor of Nashville, Tenn., placed an order for ten carloads of Crosley electric refrigerators and Koldrink bottle coolers during his visit at the factory recently.

COPELAND

Announces

AN AFFILIATION WITH

TRUSCON STEEL COMPANY

EFFECTIVE December 1, 1935, sales of COPELAND Electric Household Refrigerators in the United States will be under the direction of the TRUSCON STEEL COMPANY of Detroit, Cleveland, Youngstown, and Los Angeles.

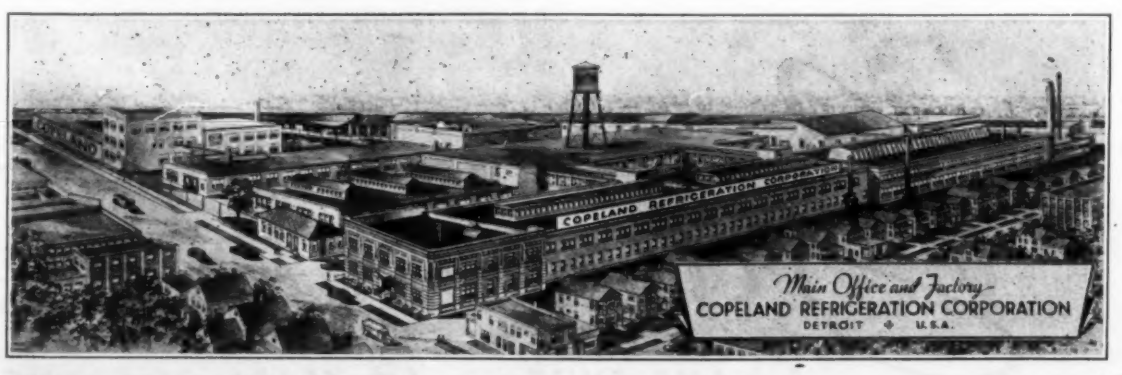
The COPELAND name achieves new and greater distinction by being chosen among many for this important association. With the stragegically located TRUSCON sales offices made available, the fine product offered through the combined manufacturing facilities of COPELAND and TRUSCON brings every advantage to progressive electric refrigerator distributors and retailers.

COPELAND REFRIGERATION CORPORATION will continue to sell household refrigeration for export. It will also continue to handle all sales of COPELAND commercial units, both in the United States and in all foreign countries.

The year now ending has been most gratifying to the COPELAND organization. We approach the new year with facilities and resources greater than ever and with a sales affiliation which enables us to concentrate more completely upon our task of building the finest type of dependable electric refrigeration.

COPELAND REFRIGERATION CORPORATION

HOLDEN AVE. AT LINCOLN - - DETROIT, MICH.



Sales Idea of the Week

By V. E. (Sam) Vining, Director of Department Store Sales, Westinghouse Electric & Mfg. Co.

Ten inches in the past from my present waistline—

A public dance hall in Cleveland—Merry Maidens; Handsome Swains; Tons of Chewing Gum;—all moving to the beat of the director's baton as though he were mixing a human salad and were about to add the dressing.

Proving,

Most culture is agriculture.

Says I, to the best-looking unattached girl in sight: "Might I have the pleasure of this dance?"

Says she, "I don't care to dance"—

—And headed for the dance floor with a truck driver who evidently had a better formula.

Says I, to the second-choice candidate, "Please, may I have this dance?"

Says she, "No"—

—And then walked off with a motorman whose sales talk I overheard.

Then—

Says I to the Queen-of-'em-all, as I grabbed her arm and tried to look like a steam-shovel operator,

"Com'on Kid, thisunsourn."

Says she, later,

"I could die waltzing with you."

Proving—

Life is its own sales manual.

Department Store Refrigeration Manager Advocates Outside Selling for Volume & Urges Employment of Supervisors

PITTSBURGH—If you're managing a refrigeration section in a large department store, and want to do it successfully, you'll have to look for most of your business outside the store, in the opinion of D. Harrison Paris, manager of Rosenbaum's here.

"A fair volume of 'transient' business may be obtained," says Mr. Paris, "but the real business is to be had by those who make a systematic effort to obtain it."

Personnel of a store's refrigeration department, thinks Mr. Paris, is an important factor in its success or failure—and he has his own standards for picking men.

Qualifications of Supervisor

"The supervisor," he says, "must be a man schooled in the principles of refrigeration—a proven salesman—and especially he must be a man who has worked in the field, and knows thoroughly the problems that the men whom he will supervise will have to solve.

'He must be fair, and honest, and broadminded enough to entertain suggestions from others. Above all, he must have the confidence of his men."

Not every man, says Mr. Paris, is a salesman—and not every salesman is a refrigeration salesman.

Types Making Up Sales Force

"The average refrigerator sales force today consists of three types: the order-taker, the floor salesman, and the salesman," he thinks.

"The order-taker picks up the apples that fall from the tree. The floor salesman does likewise, but extends his efforts and reaches for the ones on the lower branches.

"The salesman does both, but completes the job by climbing the tree and methodically stripping it of its fruit."

When you have found salesmen—and you can find them if your proposition is attractive enough—your next problem is to keep them satisfied, Mr. Paris thinks. And the only way you can do this, he says, is by permitting them to earn a satisfactory living, and by treating them fairly.

Schedule for Floor Selling

'Keeping the thought in mind that your men will be salesmen," he says, "the first thing to do is to arrange a schedule so that every man will have a chance to serve on the floor."

At least one man, besides the supervisor, should be on floor duty at all times, he states. This is especially true during the "refrigeration" months, in spring and summer.

But keeping the same men on floor duty isn't good, either. "It detracts from their initiative, and, if persisted in, gradually lowers them to the floor salesman class, and finally they become just plain order takers."

"To get the best results, a rotating system of floor duty is the only answer," he thinks. "This policy, of course, must be flexible, for there will be many times when it will be necessary to have more men on the floor.

"It's the supervisor's job to see that adequate help is available when the occasion requires."

When a prospect comes to the store and asks for a salesman not on duty that day, he should be turned over to the supervisor, who takes care of the outside salesman's interests. It will also give the day's floor men a chance to contact new prospects who might walk in.

Outside Selling Important

Outside selling, says Mr. Paris, is the backbone of any refrigeration business. "Unless your men are carrying your message directly to the home, you cannot hope for any real volume of business," in his opinion.

'You must tell them to sell them. To accomplish this, salesmen should be assigned specific territories. The nature of a department store prohibits the so-called 'closed territory,' but the salesman can be protected in his territory as far as canvassing is concerned, and his clientele will come to him when buying.

"A closed territory is not practical, for the reason that, when a man is serving on the floor, he will contact, and sometimes sell, a prospect from another man's territory. The rotating system of floor days, however, will compensate for this, and there will seldom be cause for complaint.

'Every salesman should be required to devote some time each day to canvassing in his own territory, and should not be permitted to go into another man's territory, except to follow up a lead contacted on the floor.

"The supervisor will aid in furthering and closing sales."

Good-Will Agent for Store

Refrigeration department managers, says Mr. Paris, should give consideration to the fact that the refrigeration salesman, in his outside capacity, is really a good-will agent for the store, and that many a dissatisfied customer, or former customer, is brought back into the fold of the store's buyers through his efforts.

"Though he has gained for the store the good-will of many shoppers, the end of the week may find him without a pay claim, if he has not actually sold a refrigerator," says Mr. Paris.

"All this is part of his job—and in its turn, the store could hardly do less than to give him a small weekly allowance, against his income, to keep him going."

Mr. Paris' suggestion in this regard is a plan of equity, which would allow both supervisor and salesmen to draw a definite weekly sum, whether or not their efforts during that time had shown up on the chart.

Salesman Must Be Prepared in Order to Control Interview

Review by T. T. Quinn

UNLIKE some books on this subject, J. C. Aspley's book, "Managing the Interview" (published by Dartnell Corp., Ravenswood and Leland Aves., Chicago), spends little time considering the psychological steps in the interview. Rather, it passes over these phases quickly, in order to devote more time and space to a review of actual plans and methods which have been helping salesmen in reducing the number of wasted interviews, and increasing the number of interviews "closed."

Naturally, not all of the plans presented in this book will be of use to the man who is selling electric refrigerators or air conditioning. Some will not fit in with present campaigns. But any salesman who will read this manual through carefully, and apply as many of the suggestions as possible, will greatly improve his work; get more of the business he should have but is not getting; and make himself more valuable to himself and to his company.

Preparation Beforehand

The secret of successful interviews, the author says, is in preparing for them beforehand. "There isn't a customer who won't give you bigger and better orders, if you will take time to study his problems. There isn't a prospective customer who can't be successfully interviewed and sold if the salesman spends enough time preparing for the interview," he puts it.

The reason so many salesmen have unproductive interviews is that they are not willing to do this extra work. They don't think it's necessary. But did you ever hear of any man who was really a big success who didn't work more than necessary?

A great deal is heard, and a lot has been written, about the "hustle" of the American salesman. He is regarded as the greatest "go-getter" the world has ever seen. He is, says the author—but he has one fault. He thinks he can get business by using his mouth, instead of using his brain.

The plan is what counts.

"Watch Swope of General Electric Co., Smith of Royal Typewriter Co., Lamont of American Steel Foundries, Farwell of U. S. Steel Corp., and you will find that they are able to put over big sales because they prepare first," advises Mr. Aspley. "They know as much about the problems of the man they are selling as he does. They go to their man with a definite plan in mind, a definite objective in view."

Plan Essential to Success

If you want to sell successfully, you must have a plan, based on facts. If there is such a thing as a secret for getting successful interviews, that is it. And—like so many "secrets"—it isn't a secret at all. It's something everybody knows—but that most of us are apt to forget.

It's not much of a trick to get in to see a man. It may take some strategy—but you can do it, if you think hard enough and try long enough, the author says. Getting by the "outer guard" is always a problem, if you're dealing with business officials. You can do it, if you: (1) ask for your person by name, not by title; (2) make an appointment, and be punctual in keeping it.

But the important thing, from a sales angle, is getting in to see your man under conditions which will cause him to consider your proposition, not from "Why I can't buy it," but from "Why I should buy it." When that has been done, says Mr. Aspley, you have taken a long step toward closing a higher percentage of your interviews.

After you've succeeded in getting in to see your man, the next important step is to arouse his interest. And the way to do this, the author contends, is not by the "mental domination" or high-pressure method. It is, rather, by showing a knowledge of his problems—touching a "live nerve," so to speak.

Best and safest procedure, says Mr. Aspley, is to come directly to the point. Talk about baseball scores and the weather is all right in its place—but that is not in a sales interview. A man is interested in his own problems more than anything else in the world—and if you don't know what they are, you have no business talking to him at all.

First task, then, is to show your prospect that his interests are your interests—that you are there to help him. Doing this, you not only win the buyer's interest, but you accomplish a still bigger purpose—you place control of the interview in your hands.

Be careful, in the early stages of an interview, not to make positive assertions that will challenge a buyer. The wise salesman will make it a policy to ask lots of questions—leading questions. Question asking leaves a favorable impression of modesty with the buyer. Blustering statements do just the opposite. When you ask questions, you invite faith and confidence—when you make an emphatic statement, you challenge prejudice, excite suspicion. Question asking means control of the interview at all times—positive assertions mean lost arguments over minor points. Cultivate the habit of asking questions.

Ability to control a sales situation, the author holds, simmers down pretty much to knowing the problems of the man you are interviewing, and using common sense in presenting your proposition. You will dominate the interview if your knowledge of what you are selling, and its relation to your prospect's problem, is clearly defined in your mind. If you don't know what you want to accomplish, the buyer will have the whip hand.

Concentrate on Prospect

From the beginning of the interview to the end, forget yourself. Concentrate on the man you are there to help. If you are more interested in yourself than you are in him, you can never hold his interest. Turning a buyer's interest into the desire to buy is perhaps the most important stage of the interview. It is certainly, says Mr. Aspley, the point at which 50 per cent of all sales are killed. The reason: because so many salesmen make the mistake of starting in to talk about their product too soon. They suppose an ever-present desire to buy, which simply does not exist.

No sales manager is going to "ride" a salesman for being too enthusiastic over the thing he's selling. He has to believe in it, to sell it successfully. But remember, counsels the author, superiority alone won't sell goods. A salesman first needs to make the buyer want what he's selling. All the talking points in the dictionary are only an opportunity. How much an opportunity, says Mr. Aspley, depends on the salesman himself.

Types of Demonstrations

After creating desire, the next step is the demonstration; and it may be entirely verbal, Mr. Aspley says. It is the stage of the sale when the product or proposition is presented to the buyer for his consideration and approval.

Demonstrations, generally speaking, are of two kinds: with samples, and without samples. In the case of a salesman talking refrigeration in the home, the second method, of course, would obtain. This last method calls for considerable salesmanship. It requires real skill to paint in the buyer's mind the same kind of a picture that exists in your mind. Often, important details are forgotten.

Best way to avoid making this mistake is to develop important points into some sort of a sales portfolio, so you can lay it down before a buyer, and develop your talk as you turn its pages. Mr. Aspley warmly recommends this "silent salesman." An ordinary salesman, supported by a good portfolio, can get business where the vice president of the company, without a portfolio, will fail, he contends.

But the best portfolio in the world won't make sales by itself. It has to be used—a lot.

Portfolio Secondary to Your Talk

After the demonstration, the portfolio should be put away, out of reach of the buyer. When showing it, keep it in your hands. Show the buyer what you want him to see, and make the exhibits in the portfolio secondary to your talk.

But don't expect the portfolio to take your place. Make it a part of you—but a secondary part, always.

In making the demonstration, necessity for getting the buyer's full attention is most important. All distracting elements should be eliminated, if possible, to insure careful weighing of every word you utter.

Another thing: be sure the buyer understands every point you make. Encourage him to ask questions of you. You can't be too sure that every point, every step, in your demonstration has registered.

Speak slowly; avoid technical terms. Remember that if your prospect gives you an order, it is not because he wants the thing itself, but because he wants what the thing will do for him. When you are talking to the buyer about what the thing you are selling can do, and why, look him right in the eye. The keen, unflinching eye is the most powerful means of holding attention.

Say Something—Don't Just Talk

Speak with authority. Be sparing of words. But when you talk, say something. Too many salesmen, says the author, just talk.

Suppose, in the middle of your sales talk, the buyer begins to fidget. What then? The thing to do is to stop, suddenly, in the middle of a sentence. This will, most times, bring the buyer up short, and serve as a gentle reminder that he isn't paying attention. Other salesmen ask the buyer for a sheet of paper—or ask him to do something for them. This usually brings them back to attention.

Examination of Failures

Failing in these moves, Mr. Aspley suggests a salesman ask himself these questions:

1. Is there anything about my voice or mannerism that will grate upon his nerves? How about my breath?

2. Have I failed to make the interview a two-sided conversation, or have I been doing most of the talking?

3. Is the point of contact on which I've pegged his interest as vital to him as I've imagined?

4. Is his fidgeting an expression of a desire to terminate the interview, for reasons which I cannot control?

While it is good strategy to suspend an interview on which you are losing your grip, it isn't best to give up too easily. Remember, when you start over, you'll have to cover all this ground again. Watch the man you're talking to—you may be able to guess what's bothering him, and turn the situation to your advantage.

Convince Buyer You Are Truthful

To get and hold a buyer's interest is one thing. To make him want what you're selling is another. To capably present your proposition and demonstrate its application to your buyer's needs, is still another. But you won't make many sales, says Mr. Aspley, until you convince the buyer that what you're telling him is the truth, and not just salesman's talk.

About the best kind of pre-closing material, he says, is a carefully selected showing of testimonial material. But the material must be organized, and carefully, too. To lay down a loose batch of letters before a prospect is an easy way to lose track of an interview.

Yes, use testimonial material whenever you can—but be careful how you do it. Here, as everywhere in the sales picture, preparedness pays.

If Prospect Wants to Wait—

Now, what about the buyer who defers buying, and asks you to leave a booklet for him to study in his leisure moments?

If you think he's sincere, says Mr. Aspley, do as he asks without question. Let him have all the literature you think he can assimilate. At the same time, pull out your appointment book, and ask your prospect when you can call back for his decision. That's your tip—if he stalls about another meeting with you, you can be sure he's using the literature to get rid of you. Then bring out your heavy artillery.

Hand him the literature, but tell him there's a point in it you particularly want to emphasize. Tell him you want to show him one more thing. Use his stall as a peg on which to hang your renewed attack.

When to Close Sale?

When to close is another perplexing problem to many salesmen. Some salesmen never ask a buyer for an order before they've run through their whole demonstration. The best ones, however, try to close as quickly as possible. They contend that when a man is sold, he should be signed up. Otherwise, you may do or say something to unsell him, and nullify all your previous good work.

Throw out "feelers"—as many as eight or nine—in the course of your talk. And as soon as you get an admission, try for the close. Don't worry about his not being thoroughly sold. After you've signed him up, you can complete the demonstration at your leisure—and do a better job than otherwise, in most cases.

If you don't get an admission, ask for the order outright, after you've wound up your demonstration. Do it without apologies, without camouflage. This will get you either of two things: the order; or a denial, and the reasons for it. On these reasons, you can peg another sales attack.

Above all, don't be discouraged by an initial turn-down. Feel that you're far from licked. Dig in and try again. Believe that you've only begun to work on the prospect. If you get that attitude, you're going to be mighty hard to be stalled and talked out of sales.

After you've made one sale, use the spirit of success and optimism which it engenders to make another one for you. No matter what you're selling, you're going to do your best work on the days when the buoyant spirit of success is in you. Make the most of days like these, is Mr. Aspley's advice.

Suppose you master the art of interviewing buyers—suppose you make sales on a satisfactory percentage of your calls. What then?

Increase Number of Interviews

Focus your attention on increasing the number of interviews, Mr. Aspley counsels. It is a sure way to increase your earnings. Lay out a plan to crowd one more interview into a day's work. Better planning will do that for you. One more a day means six a week—a whole day added to your working week.

The book closes with a pungent paragraph which is best transmitted just as it was written. It is:

"The number of rungs that you will climb up the ladder of achievement during the next five years depends on your ability to properly plan your interviews; carry them through according to that plan—and to get more of the productive kind of interviews than any other member of the sales staff. You can go to the very top, or you can go to the very bottom. It is entirely up to you."

A Statement by

TRUSCON

Concerning the 1936

COPELAND

Electric Refrigerators

Effective December 1, 1935, the refrigerator sales division of TRUSCON STEEL COMPANY will handle all sales of COPELAND domestic refrigerators in the United States. TRUSCON electric refrigerators will continue to be handled through the same TRUSCON organization as before.

COPELAND, with nineteen years of history in the exclusive manufacture of precision-built refrigerating units, and TRUSCON, rich with tradition in the producing of refrigerator cabinets of outstanding beauty, now complement each other with a manufacturing experience which assures a product of incomparable merit.

The 1936 COPELAND and TRUSCON lines will soon be ready for display. They embody every modern development of the engineering and research departments of the two companies. Nothing has been overlooked in making these refrigerators the "class of the refrigeration field" in efficiency—in economy—in convenience—in sturdiness of construction and beauty of design.

COPELAND and TRUSCON distributors and dealers will be proud to show these 1936 models. The coming year promises to be the biggest in refrigeration history. Your companies have anticipated 1936 consumers' demands and tastes by providing you with merchandise that has modern appeal and distinction—merchandise you can sell.

TRUSCON STEEL COMPANY

Electric Refrigeration Sales

615 WAYNE STREET, DETROIT, MICH.

U. S. FACTORIES: CLEVELAND — YOUNGSTOWN — DETROIT — LOS ANGELES

PERSONALITIES

By George F. Taubeneck

Crystal Gazing

Sometimes the title of this page bothers us. It is definitely limiting. As for instance: the most interesting thing we've seen this month was not a personality, not people—but a laboratory.

Yet, to indulge in a modest bit of fantasy, even a laboratory can have a personality. Certainly this one does. It is the Personification of Modernism in Building. And possibly it could be said to embody the Soul of Research.

Pretty high-sounding words, those. But to tell the truth, what we say about the new laboratory of the Chicago Vitreous Enamel Product Co. —blushing almost unseen out in what used to be the capital of gangland, Cicero, Illinois—is all too likely to be unjustly meagre.

For this is a laboratory *as is* a laboratory. Its purpose is that of developing new and finer grades of porcelain (for the refrigeration industry, among others), and to demonstate new *uses* for porcelain enameling.

It is the latter function which is the most startling. To make possible the use of porcelain-enameled walls, ceilings, furniture, murals, and whatnot, the most modern of construction ideas had to be embodied in this laboratory. The results are amazing.

We took some pictures of several of the rooms—which you can see on this page and page 2—and will attempt to tell you a little about them.

Personalities behind this laboratory (at least, those whom we met) include WILLIAM HOGENSON, president; E. HOGENSON, executive vice president; D. B. WALTERS, vice president; and H. D. CHASE, assistant to Mr. Walters.

Others who helped show us the laboratory were E. W. GOETZ and GEORGE P. MacKNIGHT. Two Frigidaire engineers, W. H. PFEIFFER and E. C. AYDELOTT, went through at the same time we did.

What we saw was Tomorrow's Industrial Building.

* * *

Modern Quarters

A main laboratory room, analytical chemical laboratory, office of the director of research, color and frit control laboratory, physical instrument room, experimental smelting department, smelt record room, and shower and locker room, form the main divisions, and occupy a total area of approximately 10,000 sq. ft.

Exactly 12,718 sq. ft. of porcelain enamel were used in finishing the walls, light fixtures, columns, shower and toilet stalls, furniture, and, in two of the rooms, the ceilings.

A special acid-resisting "satin matt" porcelain enamel, developed for architectural purposes, was used for most of the interior finish. This "satin matt" consists of porcelain-on-Celotex panels, and is surprisingly light, strong, and eye-pleasing.

* * *

Checking Raw Materials

One of the most important functions of a laboratory in a plant where porcelain enamels are produced is that of checking the raw materials used in their manufacture.

Such materials as nitrate of soda, borax, cryolite, cobalt, manganese, feldspar, quartz, fluorspar, soda ash, and others, many of them from remote sections of the world, come to the plant in large shipments. It is the function of the analytical chemical laboratory to determine by analyses whether these raw materials measure up to the proper standards.

When a shipment of any raw material arrives at the plant, representative samples are taken to the chemical laboratory, where various tests are performed, to determine quality and uniformity.

In the laboratory we saw the following equipment being used for this purpose: electrolytic devices for determining such elements as cobalt, nickel and copper; draft-free balance room where all weighing is done with two chain-o-matic balances; a double work table (which includes combustion equipment), a muffle electric furnace for igniting percipitates, and thermostatic control baking equipment; and two double chemical work benches, completely equipped for various types of analytical chemical work.

A number of these devices were manufactured by General Electric, according to the nameplates.

A feature of this room is a recessed compartment, of three divisions, which contains blast lamps, electric and gas burners, hot plates, water baths, and other apparatus used in chemical analytical work. This compartment is lined with acid-resisting porcelain enamel; and the fumes from the operations are carried away through a hood and vent of the same material.

* * *

Frigidaire Useful

Like most of the other rooms of the laboratory, this one is completely lined with acid-resisting porcelain enamel, with porcelain enameled walls in pastel green and with ivory recesses, such as the compartment just mentioned, and another for storing chemicals.

Even the ceiling of this room is finished with ivory colored porcelain enamel. A porcelain-enameled Frigidaire—one of the first of the 1936 models, incidentally—is used in this room for cooling solutions.

From an architectural standpoint, this room presents an interesting study. There are five recessed windows with porcelain enameled ivory "reveals" and ivory colored venetian blinds.

Between these windows, and lining the rest of the room, are panels of pastel green porcelain enamel trimmed with satin-finish stainless steel strips, all running in vertical lines. This vertical effect is emphasized by the use of lumiline lamps, also installed vertically.

An ivory-colored porcelain-enameled panel, starting 10 ft. from the floor and rising 3 ft. to the ceiling around the top of the room, together with a ceiling of the same color, provide a pleasant color harmony.

The modern door to the balance room, with an unusual glass pane which may be removed merely by releasing the stainless steel strip, is another feature.

* * *

Optical Illusion

Door to the chemical laboratory is also of modern design, and the interior approach to it is unusual—from an architectural viewpoint, at least. It has a series of setbacks running vertically with green faces and ivory reveals, the inside and outside corners of which are trimmed with stainless steel. Coming in, the room looks ivory; going out, it appears green.

This room was designed to eliminate horizontal lines, thereby reducing the possibility of dust or dirt collection. It is an example of a logical type of construction for food processing and handling, milk handling, brewing, and other industries, as well as for operating and hospital rooms, and for any other plant where the utmost in cleanliness and sanitation must prevail.

From the chemical laboratory we were escorted to the experimental smelting laboratory, which is a room 41 ft. long and 19½ ft. wide (we were told).

It was explained that after the raw materials which go into the manufacture of porcelain enamels are thoroughly tested and checked, they are mixed together in their proper proportions and smelted.

The same procedure as followed in the manufacture of commercial enamels by the Chicago Vitreous Enamel Product Co. is used in the development of new enamels in its laboratories.

* * *

New Enamels

It was emphasized, however, that developing a new enamel is a long process. That's why a large experimental smelting department has been constructed. The room in which this department is located contains three experimental smelters with a capacity of from 50 to 75 lbs., depending upon the type of enamel being developed, and two larger smelters of 150-lb. capacity.

These smelters have been equipped with highly modern controls, so that each unit has individual blowers, burners, pyrometer, and draft or stack controls. They are larger than the usual type of experimental smelter, we were told, because Chicago Vitreous Enamel chemists believe the results obtained with smelters of comparatively large capacity present more accurate indices as to an enamel's commercial possibilities.

All experimental smelts are mixed first in the 50-75 lb. smelters. If initial results are found to be satisfactory by the engineers in charge, the smelts are transferred to the 150-lb. units, where trials of almost full-scale dimensions are made.

This hurdle cleared successfully, regular-run smelts are made in a 900-lb. smelter to make sure as to whether the new enamel will be adaptable for production in the regular commercial smelters of this company, which are the largest in existence.

As a final test, the variety of porcelain enamel which has been developed through these many trials, often as many as 200 to 300, is applied to metal shapes and fired in the regular enameling furnaces in the Chicago Vitreous Enamel plant, under actual commercial conditions.

During the research on and development of these new enamels, numerous interesting tests are made after each experimental smelt. All testing is done in the main laboratory room, to which 5,000 sq. ft. of floor space (the guides were always careful to give dimensions) have been devoted.

This room contains three miniature porcelain enameling plants. One of them is devoted exclusively to the testing of enamel smelts; another is used for color matching purposes, and one is used for general enamel development and research.

Physical tests not requiring a darkened room, such as cross-bending, impact, thermal shock, and tests to determine the coefficient of expansion and general workability, and covering power of porcelain enamels, are also performed in this section of the laboratory.

A partial list of the equipment installed here would include: two large and two small electric enameling furnaces; electric hot plates; dryer, complete spraying equipment at each furnace; sinks for washing out spray guns and other equipment when changing from one experimental enamel to another; dipping racks; special type milling rack where 20 small mills of porcelain enamel may be run simultaneously; four large experimental mills; and miscellaneous equipment.

To facilitate this work, and to demonstrate further what can be done with porcelain enamel as a building material if properly designed and constructed, this 100 by 50 ft. room (there we go again) has been made into a "thing of beauty" (but not, however, a "joy forever," because the experiments conducted therein will all tend toward making the room obsolete as soon as possible!).

Its walls are completely finished in porcelain enamel. The color scheme, however, is reversed (according to conventional ideas) in that the panels are a light blue at the base of the wall and gradually become darker as they near the top, the effect set off with a trim of stainless steel.

At the top is an illuminated frieze of porcelain enamel, which glows softly under indirect lighting, and which creates an illusion of perspective, so that it gives the effect—of all things—of a row of arches.

The lally columns in this room have been transformed into decorative pillars, which are really complete lighting fixtures. This transformation has been accomplished by means of a series of seven porcelain enameled drums, trimmed with stainless steel and blending with the wall colors. These taper from the floor to the ceiling.

At the top of the columns appear four large circular and conical discs, which distribute the indirect light in such a manner that there are no shadows at the column's base.

Porcelain enameled reflectors are recessed into the pink ceiling. Three of these have been made into beam lights by means of what the guide termed "parabolic mirrors" and "spill rings," providing a concentrated beam over a small area where strong light is needed (as, for example, inspection work).

* * *

Color Control Room

The color and frit control laboratory, adjoining the main laboratory room, performs a definite function in the development and control of porcelain enamels.

This room contains a series of inspection tables, drafting instruments, and other equipment for performing the following functions: inspection of enamel samples from every smelt made in the company's commercial smelters; inspection of enamel samples from each research and experimental smelt; inspection of color samples for commercial color matching and color laboratory development.

It also provides facilities for filing physical and chemical tests of all raw materials.

This room—in contrast to the others —is very definitely a "daylight room." Porcelain-enameled paneling in a peach color is carried to door height. The top section of walls and ceilings is of masonite covered with aluminum leaf, which acts as a light reflector, conserving and utilizing all daylight which enters the room. Plum-colored trim, plus stainless steel strips, relieve the peach walls. The furniture and floor are pearl gray.

An interesting electrical feature of this room is a new type plug-in strip on two sides of the room, enabling the ceramists to plug in electrical devices at intervals of 6 in. Artificial lighting in this room is indirect, and the source is concealed.

There is still another (and entirely different) laboratory within these new general laboratories. This is the physical instrument room, where such important work as the following is done: measurements and determination of enamel properties for reflectance or covering power by means of a reflectometer; determination of thermal expansion through use of the interferometer; comparison of colors with the spectrophotometer; microscopic examination for various magnifications; determination of porcelain enamel coating thickness through use of an electric thickness gauge; and photomicrographic work.

The nature of the work done here calls for a darkened room, hence the color scheme and lighting effects have been most carefully developed. The walls of the room are finished in burgundy red enamel panels, which also have a gloss finish between the diamond pattern. This has been stencilled to give an etched or sandblasted effect.

Recesses which have been designed for shelves upon which to place various pieces of delicate equipment are finished in a deep blue porcelain enamel. The ceiling, furniture, and Venetian blinds have been painted in the same color. The only general lighting emanates from a porcelain enamel trough in the ceiling extending the length of the room. This provides a dim streak of light.

Other light in the room is confined to that furnished by or with the instruments themselves, such as a photomicrographic camera, interferometer, reflectometer, and densitometer.

* * *

A Non-skid Floor

In keeping with the surroundings of the new laboratory, which should provide an added incentive for painstaking work, considerable thought was given to the design of the shower and locker room. This contains lockers for the laboratory personnel, two toilet stalls, two lavatories, and a shower stall.

A salient feature of the latter is a non-skid floor of porcelain enamel—which should be a great boon to mankind.

Extending around the room (and even on the front of the toilet and shower stalls!) is a porcelain enameled *mural* with a marine motif. The ceiling and upper walls are in black porcelain enamel with horizontal stainless steel strips. That gentlemen, is carrying this decorative business just about as far as it has ever been taken.

The laboratory is completely air conditioned. Cooling effect is obtained through the use of water from the company's own well. The filtering of air prevents any foreign materials from coming into the rooms, and possibly contaminating the frit.

All air-conditioning equipment is housed in the smelt record room, where records from every smelt made in the plant of the Chicago Vitreous Enamel Product Co. are filed for ready reference.

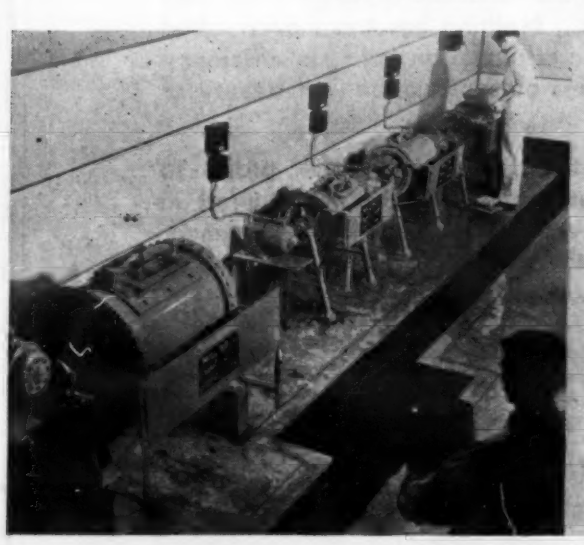
B. T. SWEELY is the director of research for this company, and it is in his office that the important and intricate work of the laboratories is directed and coordinated.

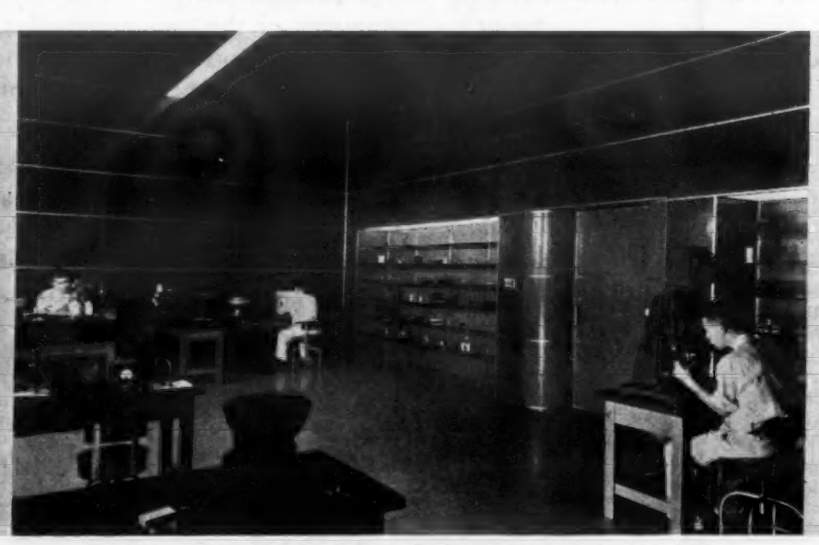
Mr. Sweely's office has been designed to be a room with no sharp angles. This room is rounded off into large radius corners, introducing curves all running in parallel planes. The walls are of "egg plant velvet matt" porcelain enamel, and the ceiling is a bright green with two bone white stripes.

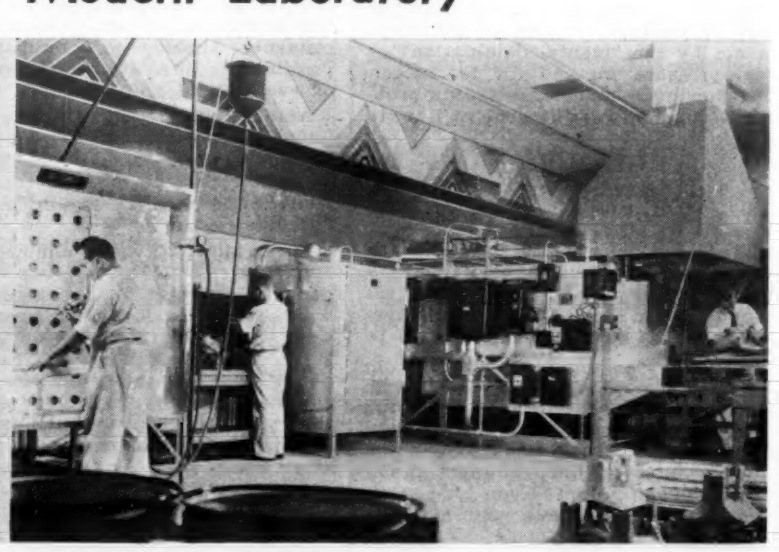
The floor is in egg plant linoleum, with a circular bone white stripe following the contour of the room. The highly modern furniture is bone white, with the desk and table tops in green porcelain enamel. The filing cabinet has bone white woodwork with a green porcelain enameled top.

All upholstering is green and white pigskin fabrikoid. In a recessed compartment of the room is a comprehensive library on ceramics.

Porcelain Enamel Manufacture Demonstrated in Modern Laboratory







In the Chicago Vitreous Enamel Product Co.'s research laboratories is a miniature enameling plant, where "mixes" are given thorough tests before being put into actual production. (1) A battery of grinding mills, for grinding smelts of enamel produced in the experimental smelters. (2) The physical instrument room, or "dark room," devoted to physical testing of enamels. Here are used such instruments as the reflectometer, interferometer, spectrophotometer, electric thickness gauge, and photomicrographic camera. Note the unusual wall treatment and lighting effects. (3) One of three miniature enameling plants, for general research and development. Pictured are a spray booth and equipment, dipping tank, dryer, and large laboratory electric furnace.

Service Men Obtain Many Leads for Sale Of Refrigerators from Satisfied Customers, 101 Typical Westinghouse Dealers Report

MANSFIELD—Importance of the service man in the electric refrigerator *merchandising* picture is brought out in a recent survey of 101 "typical" Westinghouse dealers. Eighty-nine per cent of the firms interviewed reported they obtained a good share of sales leads from service men, as a result of satisfied customers.

Seventy-one per cent of the dealers were handling only one line of refrigerators. Approximately 96 per cent reported that the salesmen they employed were sent out into the field only after special courses of training.

Regular sales meetings were considered essential to successful selling by 87 per cent of the dealers. The greatest percentage of these, 46, the survey disclosed, held meetings more than once a week, while 20 per cent held regular meetings every morning, before the start of the business day. Eighteen per cent considered monthly meetings sufficient, and the remaining 11 per cent got their salesmen together infrequently and irregularly.

Newspaper advertising was by far the most popular with the dealers surveyed, 93 per cent making use of this medium. A little more than half, 57 per cent, used billboards, while 32 per cent found radio advertising an effective method for boosting sales.

Ninety-four per cent reported that they tied-up their local advertising campaign with the manufacturer's national theme.

Literature from Westinghouse headquarters, factory window display service, and other nationally planned promotion materials found a ready acceptance with practically all the dealers covered in the study. Enlargements of Westinghouse magazine advertisements were used by 88 per cent of those surveyed. Fifty-two per cent of this group posted them in their show windows, 26 per cent tacked them up elsewhere in the store, 15 per cent used both store and windows.

As the most important factors in their business, the 97 per cent reporting named several factors. Highest was "satisfied customers," 42 per cent placing this factor above everything else. "Good selling" was chosen by 38 per cent; "advertising," 35 per cent; "Westinghouse performance" by 32 per cent; "Westinghouse name" by 30 per cent; and the five-year guarantee feature by 18 per cent.

'Large Part of Home Economist's Job Is Keeping Customers Satisfied' Says Home Service Director

BIRMINGHAM, Ala.—A large part of the job of keeping a customer sold on new electrical appliances, particularly ranges and refrigerators, rests upon the shoulders of the home economist, writes Mae Howard Atwood, home economist with Union Light & Power Co., in an Alabama Power Co. publication.

"The ease with which the home economist demonstrates a new range or refrigerator, and the perfection attained in cooking a meal, is bound to register a lasting impression on the owner," Mrs. Atwood writes.

"In selling and demonstrating appliances, we come in contact with all types and classes of individuals. Individuals that differ in temperament and intelligence—some who will make a mammoth task of learning to operate a new appliance—others who learn easily and who will without much effort soon operate the appliance with ease and simplicity.

"Often the women who have difficulty in operating a new range will be careful to keep this fact from the home economist. A woman is also extremely sensitive about her inability to operate the range as efficiently as the home economist. Here again, is a problem for the demonstrator, she must sense this fact and by using diplomacy and tact continue to make repeated calls to the owner's home until she is convinced that the woman is following the correct method in the operation of the range.

"Many customers after making a purchase of a range or a refrigerator enjoy entertaining friends at dinner. Pride of possession and a desire to show the new appliance often makes a perfect setting for the home economist to stress the fact that she will call on the day of the dinner so as to make sure everything will be in readiness. Every new owner appreciates this service, and, after her first dinner party has proved a success, she should be completely sold on the equipment. Parties of this kind pave the way for more and more prospects."

The part which the home economist plays in the sale and satisfactory use of appliances will vary according to local problems and conditions; but Mrs. Atwood suggests the following general rules, which, she says, should govern conduct of the job:

"1. To give every customer a clear presentation of the appliance and all its features.

"2. To impress the customer with the value of the appliance as it affects her particular case.

"3. To prove beyond doubt that the appliance will do everything as represented before the sale. This can be accomplished by the home economist's demonstration.

"4. Have the customer operate the appliance under supervision.

"5. Call back on the customer until she is entirely familiar with the operation of the new appliance.

"By following such a plan," Mrs. Atwood says, "customers are sure to be thoroughly satisfied owners of appliances. An appliance properly demonstrated seldom has to be repossessed because of poor operation."

'Pay Day' Terms Prove Popular Method of Financing Sales in Casper, Wyo.

CASPER, Wyo.—Dealers in this western payroll center where railroads, refineries, and other large employers commonly pay twice a month, have arranged "Pay Day Terms," for collecting monthly allotments on electric refrigerator and other appliance sales.

Most payroll checks are drawn on banks in Oklahoma, Chicago, or similar out-of-state banks. Because service charges are high, and out-of-town collection expensive, employees have formed the habit of visiting the dealer to whom they owe money on pay day, making a payment on their electrical unit, and receiving cash change.

The account is considered delinquent when five days have elapsed after "pay day," in this town.

When customers try to get around the payment with the remark that they "can only pay $1(instead of the full amount," merchants ask the reason, and grant the extension reluctantly, to make the customer feel that a great favor has been granted.

If partial payments become a habit, the merchant explains to the customer that extra labor is required to handle such accounts, and asks for his cooperation in the matter.

Porto Ricans Achieve Two-Month's Quota In Two Weeks

PORTO RICO—Salesmen in the "Game-Cock" contest conducted recently by the Porto Rico Railway Light and Power Co., made their two-months quota of 76 sales in two weeks, and went right on adding to the total, reports W. L. Zwigard, superintendent of merchandising.

At the close of the contest a prize-award dinner was given by the Westinghouse Electric International Co. F. Krug, vice president of the power company, presented winning salesmen with prize money and commissions.

Julio Enriquez, head of the agency at Vega Baja, sold 35 units during the two months campaign, despite the fact that his territory was relatively small. His agency received a cash prize for being the first to make its quota, and a first prize for selling the most refrigerators over quota.

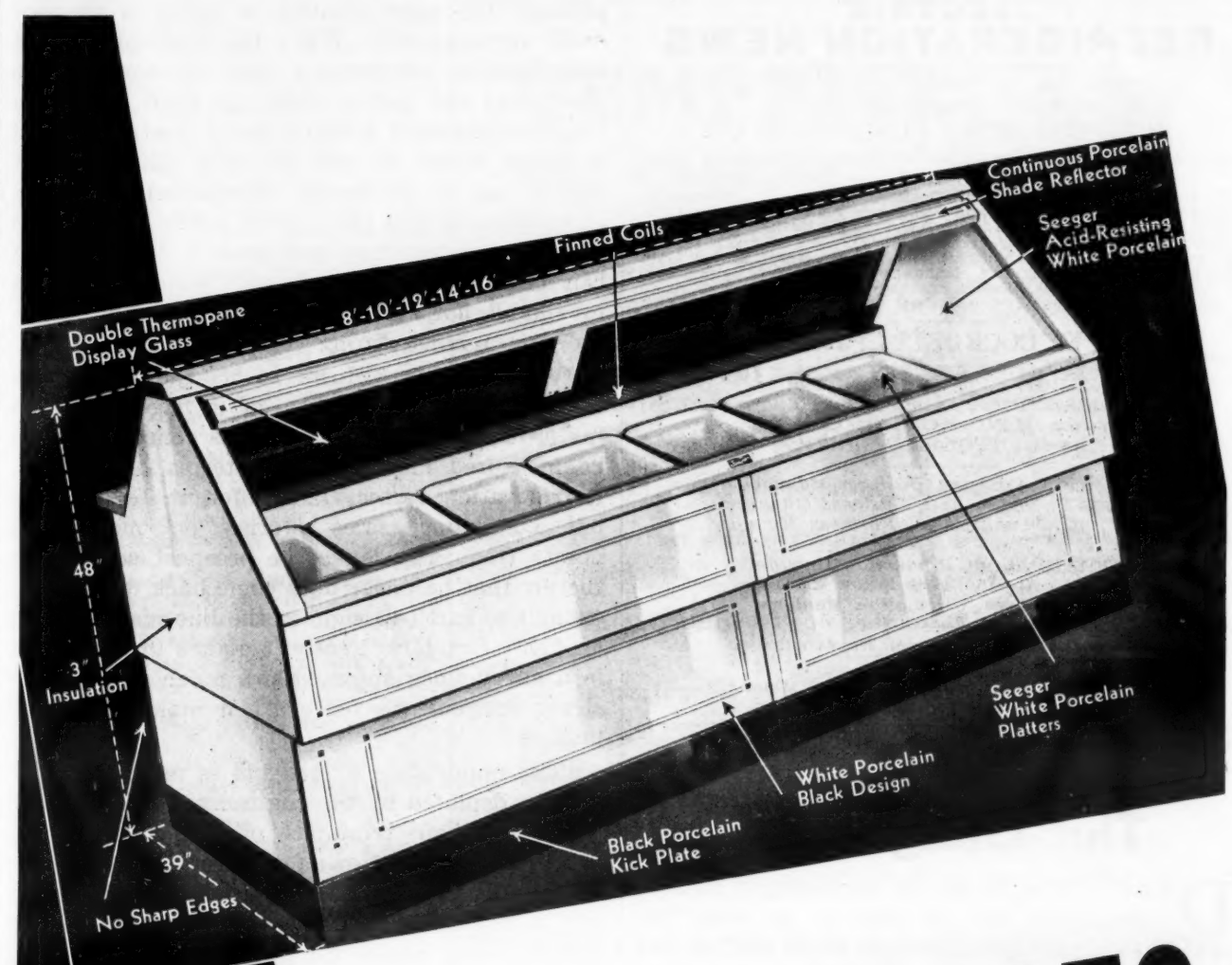
Blackfoot Dealer's Sales Up $2,000 in August

BLACKFOOT, Idaho—L. J. Green, electric refrigerator dealer here, reports that use of the modernization credit plan of the Federal Housing Administration has upped his sales volume $2,000 for August over his volume made during August, 1934.

Swope Resigns as Head of G-E Supply Corp. Board

SCHENECTADY—Gerard Swope has resigned as chairman of the board of directors of the General Electric Supply Corp., and J. L. Buchanan, formerly president, has been elected chairman of the board in his stead.

J. L. Busey, formerly manager of sales of the appliance sales division of the merchandise department of G-E, has been elected president of the General Electric Supply Corp.



Series 7

DISPLAY CASES

BY

Seeger

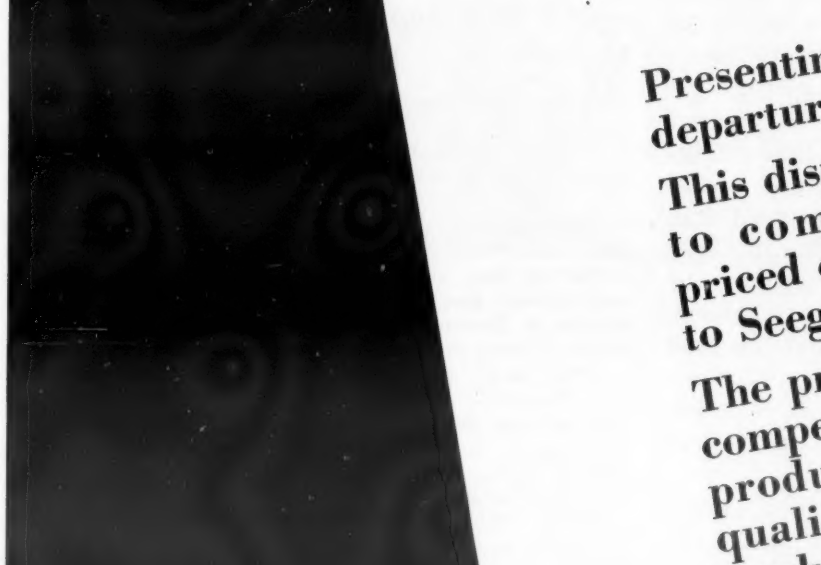
SAINT PAUL

Presenting Series 7 . . . a departure from the usual.

This display case is built to compete with low priced cases . . . but, built to Seeger standards.

The price is low to meet competition . . . yet mass production allows for quality materials and workmanship.

Learn all about this opportunity for quick sales. Write For Details.



SERIES SEVEN (REAR)

Seeger Refrigerator Company

SAINT PAUL, MINNESOTA

New York, N. Y. *Boston, Mass.* *Chicago, Ill.*

Los Angeles, Calif. *San Francisco, Calif.*

Special Representatitives—Meyer Smith Co., Buffalo, N. Y.

Seeger-Philadelphia, Inc., Philadelphia, Pa.

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VOL. 16, NO. 12, SERIAL NO. 348, NOV. 20, 1935

The Gadget Era

DEALERS begin to get exceedingly curious about this time of year as to what the new lines of refrigerators are likely to feature. Some dealers are a bit unsettled in their own minds as to just what make or makes they intend to sell in the coming year, and are anxious to get glimpses of the new models so that they can begin to make up their minds on this important subject. Others, reasonably sure as to what makes they intend to represent, want to size up the new lines so that they can figure up just about how much money and effort they should expend next year in promoting them.

Questions these dealers are now asking about 1936 lines of household refrigerators are like questions as to the exact number of units each manufacturer has sold during any given period of time: they cannot be answered because manufacturers consider such information as private and do not wish it to be made public. Nor can the manufacturers be blamed for this attitude; for when one calls one's shots in advance, the intended target frequently isn't there when the actual shooting takes place.

In general, however, dealers can be assured that the 1936 models of household electric refrigerators will be the most *convenient* and *useful* ever placed on the market. Eye appeal has been taken most seriously in the design of these new refrigerators; and so has economy of operation, in the design of the mechanisms. But most of all, sales executives have insisted that their engineering departments devote serious attention to the development of devices which will make *using* the refrigerator an easier and more pleasant job.

Perhaps the most irritating feature of earlier electric refrigerators has been prehensile ice cubes. Attempting to jar loose an ice tray frozen to an evaporator has been responsible for the uttering of a deplorable number of cusswords —and no insignificant number of service calls after the deed had been done by main strength and awkwardness. Getting cubes out of the trays has also strained not a few family ties and tested the resiliency of taut tempers. In 1936, we can predict, those who buy new electric refrigerators will never realize what exasperating difficulties some of their predecessor owners went through; for in the new models much careful thought has been given to this problem, and the results of this thinking are most praiseworthy.

Opening and shutting the refrigerator door has also given rise to constructive thinking on the problem of designers. New solutions to the attendant problems of heat leakage, and ease of opening and closing, are to be presented next season—solutions embodying new principles of balance, improved hinges, handles, and gaskets, and novel methods for opening the door. The startling success enjoyed by Leonard when it introduced the foot-pedal door-opener has had refrigerator designers working on similar ideas ever since.

Of all these fields of special investigation, perhaps the most fruitful of ideas is that of shelf arrangement. When the Shelvador lifted the Crosley refrigerator out of comparative obscurity, and put it right up there with the longer-established leaders, the industry learned a lesson which it will not soon forget. That lesson, as it is being interpreted by sales executives, is that the buying public appreciates convenience features, and that a device which can be *seen, understood,* and *demonstrated,* is invaluable both in arousing interest and closing the sale against strong competition.

When you get down to it, the differences between standard makes of refrigerators—as far as the mind of customers is concerned—can be measured most easily in terms of gadgets. Refrigeration systems are different, to be sure; but conflicting sales stories on mechanical points frequently leave the prospect so high in the air that he never does come back down close enough to earth to sign on the line marked with an "X." But Mrs. Prospect makes up her mind in a hurry when she sees how much easier some clever convenience feature can make her daily task.

The importance of gadgets in merchandising may be deplored by the engineers who are justly proud of their triumphs of efficiency in the design and production of refrigeration systems; but true it is that it is comparatively easier to sell a convenience feature than it is unseen quality. So, while those manufacturers with reputations to protect must continue to build quality into their refrigerators, they will be adding new gadgets also, to help their dealers and salesmen in the competitive battle.

And after all, making the housewife's daily routine easier and simpler is a praiseworthy aim. To be sure, it is secondary in importance to proper food protection; but the manufacturer who creates and the salesman who delivers *convenience* are both benefactors of the American home, and as such can be justifiably proud of their respective callings.

WHAT OTHERS SAY

Don't Be a Sap!—A Christmas Editorial

WHEN you and I were children and tore downstairs with a whoop about 6 o'clock of a cold Dec. 25th morning, everything on the Christmas tree seemed beautiful. The spectacle filled us with wonderment. Cheap fabrications of wood, and tin, glass, and tinsel, were rare masterpieces—created by some magician in a fairyland laboratory!

And that's as it should be—at the age of 6. But the way many mature, middle-aged retail merchants still clutter up their stores just before Christmas with cheap and tawdry geegaws and gaudy gimcracks and knick knacks in December, one would think the customers of many of these stores were just 6 years old!

One glance at the typical display of "novel, unusual, and distinctive" offerings for Christmas is enough to gag old man Santa Claus himself.

What a simple child-like faith these retail merchants have in Santa Claus! They are all certain, for example, that *this* Christmas Santa will leave a neat profit in their stocking! If they were smarter, they would do like the little boy who was on his knees in his bedroom, giving up a prayer the night before Christmas:

"And," shouted the little boy, "I hope Santa Claus brings me a bicycle and a popgun!"

"Don't pray so loudly," his mother cautioned him. "God isn't deaf!"

"No," said the little boy, "but Grandpa in the next room is."

The boy wasn't taking any chances. The wise merchant shouldn't take any chances about his own profit after Christmas. He might start out by bringing forth and dusting off the hundreds of practical items that are carried in stock that people need and would prefer to buy as gifts this Christmas if these items were only tastefully presented in holiday dress.

Most people who buy beribboned, paint-besprinkled dreck each December do so because that's all they can find in a lot of stores. Result: when the retailer looks at his own stocking on Christmas Day he finds nothing there to make him the least bit happy.

Always at the bottom of the column for December volume are housewares, mechanical appliances, bathroom accessories. Why?

Why is the heavy business only in toys, stationary, books, umbrellas, neckties? Twenty necktie transactions do not bring in as much as one good electric iron sale. Isn't a smart bathroom scale a good Christmas present? How do you know that a man who pays $15 for a half-ounce of perfume isn't just as likely to pay that much for a set of new aluminum or enamel ware or a hospitality tray? And how do you know the recipient will not be just as much pleased?

There are bound to be a certain percentage of your customers who would rather select a practical, useful gift in housewares in preference to some imitation-satin-covered pin cushion, or a box of stationery covered with wall paper. Ask Santa Claus, he'll tell you: "Don't be a Sap!"—*House Furnishing Review,* November.

LETTERS

Patterson in a Book?

Bourla Freres & Cie
Istanbul-Galata, Hezaren Caddesi, Na.1-3

Editor:

Under the correspondence columns in the October 2 issue of ELECTRIC REFRIGERATION NEWS, we read at the foot of the last column a letter from Samuel S. Vineberg, Manager-Secretary to Electrical League of the Niagara Frontier, in which he tells of his enjoyment of the articles about Mr. J. H. Patterson of the National Cash Register Co., and inquiring as to whether you intend making up reprints and binding them under one cover in the form of a pamphlet, in which case he would like to receive a copy.

If at any time you do issue such a pamphlet, will you be good enough to send us a copy too?

Altorfer Bros. Co.
Peoria, Illinois

Editor:

Relative to the articles which you recently ran on John Patterson, I hope that you will be able to get them out in pamphlet form, as I think there is some of the finest material I have ever read in these articles.

WM. H. KINSALL, Mgr.
Publicity Department.

Answer: The Patterson story is now being revised and enlarged to incorporate the many interesting contributions of NEWS readers. We hope to have the book off the press early in 1936. Perhaps we should make it clear at this time, however that we cannot make a free distribution of the book.

Data on Production Costs

International Telephone and Telegraph Corp.
67 Broad St., New York City

Editor:

We are in receipt of a communication from one of our foreign manufacturing plants regarding information as to the production costs and list prices of electrical household refrigerators.

Their inquiry is, no doubt, prompted by a desire to compare European costs with those of America.

I would like to ask if you have published any information covering raw material, labor, and other charges making up the production cost of a modern refrigerator.

You can rest assured that any information regarding this subject will be deeply appreciated.

W. H. CAPEN,
Asst. Gen. Technical Director.

Answer: We have published the specifications and list prices of all models of all makes of household electric refrigerators in various issues of ELECTRIC REFRIGERATION NEWS. The last complete compilation of specifications was published last spring but our supply of extra copies of this issue is now completely exhausted.

At the present time we are now compiling specifications of all models of all makes, not only for the current year, but for all past years, to be published in a book about Feb. 1, 1936.

Please note, however, that this data does not include the cost of raw materials, labor, and other charges which make up the production cost. This information could be obtained only from manufacturers, and it is not likely that they would divulge such data for publication purposes.

Help for the Service Man

Automatic Reclosing Circuit Breaker Co.
Columbus, Ohio

Editor:

We can well appreciate the idea back of the editorial "Why Bring That Up?" on page 10 of the October 23 issue of ELECTRIC REFRIGERATION NEWS.

With this letter we are mailing one copy of our service manual covering all of the principal Rancostats that have been manufactured to date. You may readily see how this service manual falls right in line with the idea expressed in the editorial mentioned above.

You will recognize a portion of the service manual to be data recently published in ELECTRIC REFRIGERATION NEWS. With the additions that we have incorporated we believe that the manual will enable service men to service practically all Rancostats.

J. D. MERKLE,
Assistant Sales Manager.

News of Jobbers Meeting

Refrigeration Supplies Distributor
222 North Vermont Ave.
Los Angeles, Calif.

Editor:

We are quite interested to know just what went on at the convention last month, and have been waiting patiently for our ELECTRIC REFRIGERATION NEWS. For some reason we have not received an issue since Oct. 9. Will you kindly check into this so that we may get all the "dope."

Our entire personnel is very much interested in the paper and through the many interesting articles keep ourselves up to date.

We trust that we will receive our copy regularly in the future.

PETER H. ASKEW.

Answer: Trouble due to change of address given incorrectly by Postoffice.

Would Sell News to Clients

W-M Refrigeration Co.
2468 N. Third Street
Milwaukee, Wis.

Publisher:

Our firm would consider it a privilege to cooperate with you in bringing the valuable NEWS information to the refrigeration readers in this territory.

At the present time we have a complete file of the REFRIGERATION NEWS from 1933 up to the present time. We also have a good many copies dating back a number of years, but our file is complete for 1933, 1934 and up to the present date. We also have a copy of your DIRECTORY and MARKET DATA BOOK. We also have your sample copy of the MASTER SERVICE MANUAL. This shows that we are enthusiastic readers and pluggers for the ELECTRIC REFRIGERATION NEWS.

We note that our subscription is not due until May 17, 1936, at which time we will not doubt ourselves take on the same proposition as last year. We have also planned on ordering a MASTER SERVICE MANUAL as soon as published.

We are interested and would like to be your authorized agent for ELECTRIC REFRIGERATION NEWS and other publications that you have; and you may place us on order for 10 copies of the REFRIGERATION NEWS for resale. We will then await information from you regarding your further setup for authorized agents.

G. D. WANG.

Wants List of Parts Makers

William F. Laramee & Co., Inc.
Motor Truck Parts
Atlantic and Grands Aves., Brooklyn

Editor:

We are in receipt of our first two copies of your NEWS and wish to take this opportunity to state that in our opinion it is a real trade paper.

We are contemplating putting in a new division for the wholesale distribution of refrigeration parts and supplies.

We would greatly appreciate having you forward us a list of reputable manufacturers now catering to the replacement field on parts and accessories. As we will specialize in this field we feel certain that we will be in a position to make it mutually beneficial.

WM. F. LARAMEE.

Answer: See comment at end of this column.

Wants List of Jobbers

Automatic Reclosing Circuit Breaker Co.
Columbus, Ohio

Editor:

We thank you for your letter in which you referred us to the list of independent refrigeration service men as published in the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY.

We are also pleased to note that ELECTRIC REFRIGERATION NEWS expects to develop a list of replacement part jobbers and offer a mailing service to both independent service men and refrigerator part jobbers by about the first of the year.

We have obtained the latest list of automatic, electric, and iceless refrigerator repairers, maintenance, and service concerns, as published by Boyd's City Dispatch, but upon checking, we note that the entire list must have been taken from current issues of telephone directories, and is, therefore, quite incomplete, having omitted concerns of higher standing and better qualifications.

J. D. MERKLE,
Assistant Sales Manager.

Answer: See letter below.

New Names Are Coming In Every Week

The Inland Mfg. Co.
Dayton, Ohio

Editor:

The writer would appreciate it very much if you could give us or tell us where we could obtain a complete list of the jobbers of wholesale refrigerator parts such as shown in your Oct. 30 issue.

We trust that those jobbers shown in this particular issue are only a part of those in business in the mid-west. Any information which you could give us would be very much appreciated.

T. W. MCNENERY,
Sales Department.

Answer: There are now about 100 refrigeration supply jobbers in the U. S. and the indications are that the list will be at least doubled in number during the coming year. This is a good example of a situation in which advertising in the NEWS is the surest way to reach the new ones as fast as they arrive.

Higley Discusses Toxicity of Gases, Including Refrigerants

By H. V. Higley, Secretary-Treasurer, Ansul Chemical Co.*

As refrigeration has developed during the last decade, many people have become acquainted with refrigerants who previously had little if any interest in chemistry. The only gas intended for human consumption internally is a mixture of about 21 per cent oxygen and 79 per cent nitrogen, which is the approximate mixture in the air we breathe throughout our entire lives. Because a variety of gases contaminate the air, due to our more complicated existence today, interest is increasingly focused on the effects produced when man breathes such mixtures.

Referring particularly to refrigerants, the question that is usually discussed is, "In case of accidental discharge, what effect will refrigerants have on the public who are in the vicinity of refrigerating machines?"

Public Hazard Very Small

The public hazard involved is extremely small. There are approximately eight million domestic and small commercial machines operating with sulphur dioxide, methyl chloride, and other refrigerants, to say nothing of the large number of higher tonnage commercial installations that employ the older refrigerants, principally ammonia and carbon dioxide.

I want to discuss this question from a different angle, confining attention to the question: "What effect do various gases have on those who are handling these gases daily in varying concentrations and under a great variety of conditions?" And outside of the employees of the manufacturers of these gases and machines using these gases as refrigerants, our talk narrows down to the effect on the service engineers, the men who are actually on the firing line.

The word "toxicity" is a very broad term, covering that tendency of any substance to injure or destroy life if admitted through certain channels to the interior of our bodies.

'Toxicity' Has Broad Meaning

The range covered by the possible meaning of this word is almost unlimited. A certain quantity of food or beverage may be entirely beneficial. However, most of us have tolerances, and when we overstep these limits, the ordinary substance taken in excess is toxic to our system. This applies to candy, liquor, or almost any food.

On the other hand, the word "toxicity" is used to express the effect of the deadliest poisons. It is quite impossible to properly compare effects under such a broad term, when it can and does have such a variety of meanings. We are, of course, limiting ourselves to consideration of gases only that may be taken into our bodies by means of the lungs.

Even when we limit toxicity to gases that we may breathe, we still have possible extremes of thought. Let me list some of the kinds of gases which are toxic in varying degrees and with very different effects.

Lethal Gases

First, we have the lethal gas, such as carbon monoxide, hydrogen sulphide, hydrogen cyanide, all insidious killers. We have the tear gases or lachrymators, such as chloropicrin, that produce a choking, gasping sensation associated with gas warfare. We also have gases that are anesthetic, merciful agents in the hands of experienced surgeons, but deadly in the hands of the inexperienced or evil-intentioned.

There are the nauseating gases, such as butyl mercaptan, that chemical which makes a skunk a skunk. There are gases that paralyze respiration such as phosgene.

Toxicity refers to asphyxiating gases, and let me enumerate several ways in which gas may produce asphyxiation. First, one may breathe a mixture harmless otherwise, but too low in oxygen to support life. Second, one may breathe a gas such as mustard gas that destroys the lungs so that oxygen does not reach the blood. Third, a gas such as phosgene, causing severe idema or congestion of the lungs so that they fill up with a watery fluid, shutting off the travel of air to the blood.

Fourth, we have a gas such as carbon monoxide that combines with the hemoglobin of the blood, displacing oxygen so that the blood carries no oxygen to the tissues, causing asphyxiation. Fifth, we may breathe a gas like hydrocyanic acid that renders the body tissues incapable of using the oxygen that is available, causing asphyxiation.

This whole subject of toxicity will be easier to consider as it applies to our daily lives and occupations if we have a definite picture in our minds of the functioning of our lungs and blood circulation.

*Address given before the recent annual Refrigeration Service Engineers Society convention in Detroit.

Function of Lungs

Oxygen in the air admitted to the lungs is taken up by the blood and carried to all parts of the body. Tissues use the oxygen to produce energy, carbon dioxide being formed principally. This carbon dioxide is taken up by the blood, returned to the lungs, and eliminated from the body as expired breath. Let me add here that susceptibility to gases depends a great deal on personal sensitivities or idiosyncrasies, and just as some people have hay fever, and others do not.

Fig. 1 is a diagrammatic drawing of the respiratory tract. When we breathe, air is drawn through the mouth or nose down into the trachea, which is a tube about 4 in. long and ½ in. in diameter, covered with about 16 to 20 horse-shoe shaped cartilage rings to prevent the tube from collapsing.

The trachea divides into two main branches called bronchi, one leading to the right lung and the other to the left. The bronchi are further divided and subdivided many times, the smaller tubes being called the bronchioles. The final and most minute subdivisions are called alveoli. When you consider that there are about three million of these capillary air tubes in each lung, you will appreciate their fineness.

The lungs fairly well fill the chest as shown, with the heart located between and slightly to the left. Between the lungs and stomach is the diaphragm, a sheet of muscle, convex to the thorax. When the diaphragm contracts downward, with the ribs moving outward and upward, caused by a muscular effort, a vacuum is produced by the expanding lungs and air is drawn in, or in other words, we breathe in air, an inspiration.

Expiration or breathing out of air, is accomplished without muscular effort. The muscles relax, and the elasticity of the lungs tends to drive out air. This is assisted, when a person is standing or sitting, by the weight of the thorax, and when a person is lying on his back, by the weight of the stomach and liver. Resistance to breathing in of air can be tolerated to a certain degree. A pressure of more than two centimeters of water against breathing out of air proves to be very distressing.

Capacity and Rate of Breathing

Each lung has a capacity of about 3¼ to 3½ pints, the right lung being slightly larger. When filled to capacity with air, the lungs hold about 5 quarts each. At rest, a person normally breathes in or inspires about ¼ cu. ft. per minute. Under exertion, this may be increased 5 to 10 times. We breathe 7 to 23 times per minute, the frequency varying indirectly with the depth or quantity of air per breath.

The very fine ends of the lungs, which are called alveoli, have exceedingly thin walls of delicate elastic framework, almost completely filled with a network of capillary blood vessels, and covered only by an extremely thin membrane.

It is between the air in the alveoli and blood in the capillary vessels that the gaseous exchange takes place. Oxygen is continuously passing from the lungs to the blood, and carbon dioxide from the blood to the lungs, a remarkably delicate and dependable system that fortunately works with almost unbelievable precision.

Owing to the thinness of the walls and to the enormous total surface of the capillaries (estimated at 90 square meters, equivalent to 968 sq. ft. in the lungs of a man), the exchange or diffusion of gases is so rapid, that there is a virtual equilibrium of the partial pressure of every gas between the blood in the capillaries and the air in the alveoli.

To complete the understanding of this transfer and the use of oxygen in the body, look at Fig. 2 which shows the circulatory system. Blood which has accomplished its work in the body, and bearing its load of carbon dioxide, is returned to the right heart and pumped through the capillaries in each lung. Here the carbon dioxide is released and a charge of oxygen picked up. The capillaries unite into increasingly large vessels, passing as one tube into the left side of the heart, which pumps the blood through the aorta to all parts of the body. The blood delivers the oxygen to the tissues as required, picks up the available carbon dioxide, and returns to the heart.

The complete circuit is made in less than ½ minute. Twenty per cent of the tissues get 80 per cent of the blood, the largest proportion being required by the glands and brain. The muscle, bone, and fat use a lesser percentage.

Active carrying agent in the blood is the hemoglobin, the red cells made up chemically largely of iron. The hemoglobin has three functions: (1) It combines with oxygen and gives it up readily; (2) it provides alkali to allow formation of alkali bicarbonate for transportation of carbon dioxide; (3) it takes up and gives off alkali so readily, being itself a very weak acid, that it maintains the acid alkali balance of the blood within very narrow limits.

The other cells in the blood, the white cells, many in number and bearing rather formidable names, are the protective or healing cells. They travel to any part of the body where there is infection and swallow up the invading germs. Their number is relatively small normally, but there is a very rapid increase at the time of infection.

Oxygen delivered to the tissues is of course used up in producing the energy required by the body in all of its functions. It can be expressed in heat units. For instance, a man

(Concluded on Page 10, Column 1)

Respiratory System

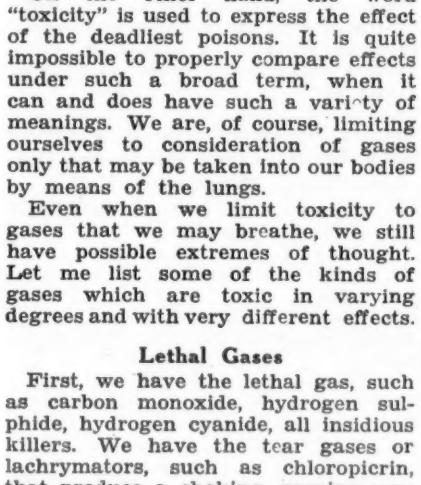

Fig. 1—Parts of the respiratory system which are affected by toxic gases.

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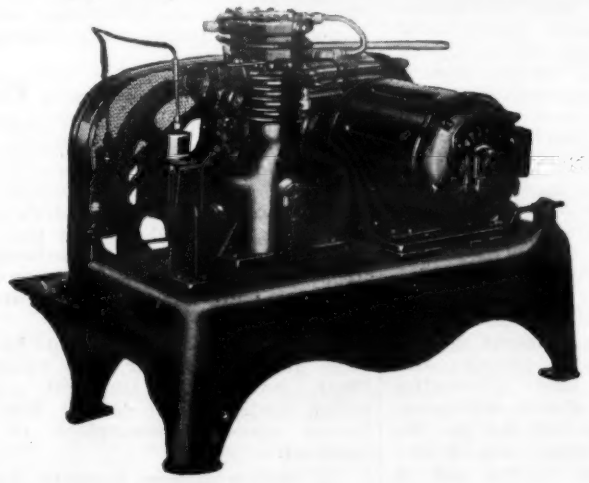
Refrigeration by Wire



ITS perfect coordination with the modern cabinet and counter type freezer, gives the Universal Cooler Condensing Unit a decided preference. It serves efficiently and economically wherever it is used. Universal Cooler Condensing Units are supplied for all refrigeration applications.

UNIVERSAL COOLER CORPORATION
DETROIT, MICHIGAN BRANTFORD, ONTARIO
MANUFACTURERS OF A COMPLETE LINE OF HOUSEHOLD AND COMMERCIAL REFRIGERATION

Toxicity of Various Gases Discussed By Higley

(*Concluded from Page 9, Column 3*)

weighing 150 lbs. requires 4 B.t.u. per minute when he is resting in bed and fasting. That is, when his stomach is not busy digesting food. When sitting up, he uses 6 B.t.u. per minute, standing 7 B.t.u., walking two miles per hour, 12 B.t.u. per minute; walking four miles per hour 23 B.t.u., slow run 40 B.t.u., and for maximum exertion, 56 to 80 B.t.u.

Regulation of the quantity of air we breathe is almost entirely effected by the carbon dioxide, the percentage of which remains almost constant in the air in the lungs. The reserve of oxygen in the body is sufficient for only a 5 or 6 minute supply and it is therefore fortunate that oxygen is not the governing agent.

CO_2 Acts as 'Flywheel'

We must have something that acts more like the flywheel on machinery, so that breathing is carried over any period when the oxygen suply is insufficient. The carbon dioxide acts as this particular wheel. The slightest increase or decrease of the carbon dioxide formed in the body induces almost immediately a proportional increase or decrease in breathing.

When we exercise, more oxygen is required by the tissues involved, more carbon dioxide is formed, breathing is instantly increased, and more oxygen is available to make up a possible deficit.

The air we breath, as stated before, contains 21 per cent by volume oxygen. The expired air has lost 5 per cent oxygen, but contains about 4 per cent carbon dioxide. The difference of 1 per cent is accounted for by the fact that some of the oxygen is used to oxidize elements other than carbon, such as the hydrogen of fats, and the sulphur in proteins.

Breathing is, of course, almost entirely involuntary, as the carbon dioxide provides complete control. The average person can hold his breath only 30 to 50 seconds. If he takes a breath of pure oxygen, it is possible that he can hold his breath somewhat longer.

If you breath deep and fast for about 30 seconds, you will find that you will then have no desire to breath for a short time. By doing this, you could undoubtedly hold your breath for two or three minutes. If at the end of this forced breathing, you fill your lungs with oxygen, you can probably hold your breath two or three times as long or perhaps 6 or 7 minutes. Undoubtedly, it was some system of this kind that permitted Houdini, the remarkable magician, to hold his breath such a long time while he made miraculous escapes under water.

Impulse for these muscular movements comes over motor nerves from the spinal column. These control nerves are therefore like the electric sparking apparatus in a gasoline motor. There is a central control, a sort of super-telephone switchboard, where all impulses are sorted, and proper instructions issued. This is located in the lower part of the brain.

Per Cent of Oxygen Necessary

Percentage of oxygen in the air we breathe is not so important, provided it does not decrease too much. The normal is 21 per cent. It can drop to 16 per cent without noticeable discomfiture, although a candle will go out in such an atmosphere.

At 12 per cent, there may be no discomfiture, but an increase in pulse and breathing, muscular effort becomes more difficult, judgment is diminished, the mind confused. At 6 to 9 per cent, unconsciousness. Mountain sickness is the result of lack of oxygen, with carbon dioxide developed remaining the same.

A badly ventilated room does not produce discomfiture because of too much carbon dioxide, as is often believed. Expired air contains about 6 per cent moisture, and is warmed. It is therefore lighter than normal air. The unpleasantness is due to heat, moisture, and odors not resulting from respiration. The percentage of carbon dioxide is too small to make a difference.

In conclusion, I will attempt to explain the action of various gases when breathed. Please note the wide variety of effects. You will see how futile it is to make comparisons in cold figures to show toxicity. The warning action of a gas, the ability to detect a leak, the kind and degree of action resulting, the after-effects, etc., all these must be taken into consideration.

It must also be borne in mind that while the original gas may be relatively harmless, it may change to a harmful chemical, or it may be decomposed by heat or flame, to harmful gases before it is breathed.

Action of Irritants

Let us consider irritants first, for their action is perhaps easiest to understand. Do not confuse irritation with corrosion. Irritation results in inflammation, which is a disturbance of the tissues and their normal functioning.

There is a great difference in the way irritants act when breathed, and this difference varies with their physical properties. Their solubility in water is one of the determining factors.

Soluble gases react with the moist tissues, which they first meet in the upper throat and trachea and for this reason, the resulting danger is less, for the upper tracts are tougher. The nose may be almost raw and still heal quickly and completely.

The nearer the effect approaches the lungs the more complicated and dangerous it becomes. The less soluble gases are therefore more dangerous.

Usually these irritants react chemically and expend their ill-doing proclivities in inflaming tissues. They seldom go into the blood in their original state, or if they do, no further damage results. Irritants in the upper tract cause pharyngitis and laryngitis, lower down, bronchitis, and in the lungs, edema or congestion.

After severe exposure to any gas, care should be exercised against infection. One's resistance may be lowered so that disease may become active. The gases will not cause tuberculosis, but an inactive case might become active if bodily resistance made one susceptible.

Ammonia reacts almost entirely in the upper trachea, causing spasms or edema of the larynx, which may be very serious.

Effect of SO_2

Sulphur dioxide reacts mainly in the upper respiratory tract, limiting its action to irritation of the surface tissues. Severe exposure would naturally result in the inflammation extending deeper in the lungs to the bronchi or to the lungs proper causing edema.

Sulphur dioxide has no cumulative effect. It does not react with the hemoglobin of the blood. If carried by the blood, it is taken up and eliminated by the kidneys.

Both of these gases give warning of their presence in most minute concentrations. Leaks are easily located, and therefore cases of acute irritation are rare in spite of the fact that these gases are used so extensively in millions of machines.

In the presence of flame, sulphur dioxide will not break down. Ammonia burns to nitrogen and water, both harmless.

How CH_3Cl Reacts

Methyl chloride is not an irritant in itself. It goes into the blood stream, and may cause some anaesthesia. It reacts on the nerve tissues entirely.

It hydrolyses to methyl alcohol which is not as readily eliminated from the system as ethyl alcohol, with which many of you are undoubtedly familiar. It may decompose under heat to carbon dioxide and hydrochloric acid, but absolutely no phosgene. A trace of carbon monoxide may be formed. Hydrochloric acid is an irritant that tends to act on the middle of the respiratory tract, falling somewhat into the class with sulphur dioxide.

Methylene chloride is usually classed as a volatile drug. Its action is probably like that of methyl chloride. However, there is one difference that must be mentioned.

When methylene chloride breaks down under heat, it forms hydrochloric acid, carbon dioxide and phosgene. It is therefore interesting to note the effect of this last mentioned gas. It does not act on the upper respiratory tract but works down in the alveoli. It was one of the principal war gases.

Not making its presence known by irritation, it can be present in lethal concentrations without warning, 25 p.p.m. being considered dangerous for even a short space of time. It induces severe pulmonary edema, an excessive secretion of watery fluid. The victim drowns in this secretion in his lungs, as air cannot of course reach the blood.

Circulatory System

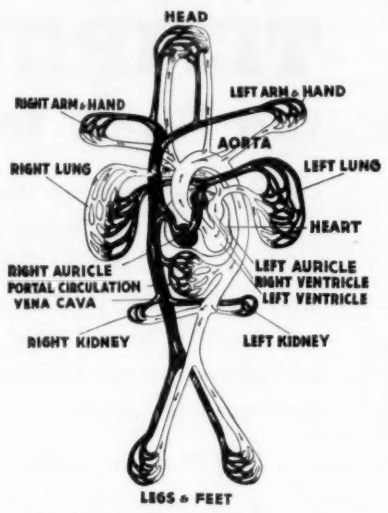


Fig. 2—Details of the human body's circulatory system.

When Freon Decomposes

The chloro-fluoro derivatives of hydrocarbons such as Freon are generally regarded as very safe refrigerants, except that here again we must take into consideration the results of a break down when the gas comes in contact with a flame.

Phosgene is formed in appreciable percentage, and we have just described its effects. Also hydrochloric acid and hydrofluoric acid are formed. The latter is one of the most corrosive acids we have and its action very serious. In addition to reacting on the lungs, it tends to form ulcers in the lungs, that are very difficult to heal. These products of combustion, hydrochloric acid and hydrofluoric acid, and phosgene are more dangerous than any gases now used as refrigerants.

The dangerous effect of phosgene in peace-time pursuits was first demonstrated in the use of what was supposed to be a perfectly harmless carbon tetrachloride fire extinguisher. for some time, deaths which occurred during fires where these extinguishers were used were not explainable, but it was found that the carbon tetrachloride broke down into phosgene and was responsible for the deaths. The fact that harmless materials may break down into very harmful gases in a fire was also well demonstrated in the Cleveland clinic disaster, which you may recall. Here, nitro-cellulose film burned and produced nitrous oxide, phosgene, and carbon monoxide. About 100 people lost their lives in this fire.

Two other gases, with which you are familiar though they are not used as refrigerants, serve to show other types of reaction in the lungs or body. Most of you are familiar with hydrocyanic acid, which is used primarily for fumigating work, and is known as a most deadly gas. It has little odor or taste and therefore is very treacherous.

Its action is to arrest the activity of all living matter. The cyanide is carried by the blood to the tissues, and the tissues cease to function, or use oxygen. The result is an internal asphyxia. The blood in the veins is red, in a victim, for the oxygen has not been used. In ordinary cases of cyanide poisoning, the man falls after a few breaths and death follows in six or eight minutes.

Let us conclude with mentioning carbon monoxide, a gas that has a slight garlic odor not normally noticeable. This gas is a real threat in every day life and actually takes its daily toll.

Illuminating gas contains 20 to 30 per cent, coal gas 4 to 6 per cent; it is present in coal fires, house heaters, water heaters, burning buildings; it is the "after damp" present after mine explosions. It is ordinarily formed from the incomplete combustion of carbonaceous matter.

The exhaust from auto engines contains 1 to 7 per cent, equivalent to one cu. ft. per minute per 20 hp. This is sufficient to make a one-car garage with closed doors deadly in five minutes. In congested traffic, the concentration may reach 100 p.p.m., enough to cause a headache.

Carbon monoxide unites with the blood to the exclusion of oxygen. The attraction of hemoglobin for carbon monoxide is about 300 times that for oxygen. The net result is therefore acute asphyxia. In the blood, carbon monoxide does not oxidize to carbon dioxide, and therefore it must be slowly eliminated through the lungs.

Proper treatment for anyone suffering with carbon monoxide poisoning is, first to remove him to the fresh air and lay him on his stomach with his face to one side. If the person is still breathing he should be fed oxygen mixed with 7 per cent of carbon dioxide. The carbon dioxide stimulates breathing and the oxygen replaces the carbon monoxide in the blood. If the victim is not breathing, artificial respiration must be used, supplemented by the oxygen-carbon dioxide treatment. Drugs are of no benefit and alcohol as a stimulant should not be used.

Lack of Knowledge Causes Fear

To many people, there is considerable mystery as to the effects produced when gases other than air are breathed. This feeling of mystery results in an excessive fear of the consequences, a mental attitude that has no basis on facts, but is conjured up from lack of knowledge or from comparisons with unrelated incidents or circumstances.

Nature is a most marvelous healer. The physician is her able assistant. Both, however, obtain best results when their patient is not laboring under some misconception of his ailment.

All industries have hazards. An external injury such as a cut finger is common. The victim has his wound dressed, and is convinced that it will quickly heal. If he has an overdose of one of the ordinary refrigerant gases, he should feel equally certain that the effects will be eliminated by proper care.

MASTER SERVICE MANUAL

Chapter 9—Service

Service Operations on Type 1A Flooded Systems (Concluded)

By K. M. Newcum

Service Operation No. 18. Changing the Float Valve Strainer.

(The float valve strainer is located between valve No. 4 and the float valve needle and seat. If valve No. 4 is of the two bolt flanged type, proceed as follows:)

a. Close valve No. 4.

b. Proceed to evacuate the evaporator as in changing a float valve, Operation No. 11.

c. With evaporator evacuated, and the pressure balanced at 0 lb., close valve No. 5, unbolt valve No. 4 and remove.

d. Remove clogged strainer and either replace with new one or leave it out altogether, and supplement with highly efficient filter in liquid line outside valve Nos. 3 and 4.

e. Reinstall valve No. 4. Close valve No. 1. Loosen suction line connection at valve No. 1. Open valve No. 5. Crack valve No. 4 and purge evaporator and suction line.

f. Tighten suction line on valve No. 1. Open valve No. 1. Open valve No. 4. Open valve No. 3.

g. Test for leaks, and put system into operation.

(If liquid line valve is screwed into the header, such as shown in Fig. 85, proceed as follows:)

a. Close valve No. 3.

b. Install pinch-off block on liquid line and tighten just outside of valve No. 4.

c. Evacuate evaporator and balance pressure to 0 lb. through gauge set.

d. Close valves Nos. 1 and 5. Remove valve No. 5.

e. Disconnect liquid line from valve No. 4.

f. Remove valve No. 4 and remove or replace strainer. Reinstall valve No. 4.

g. Reconnect liquid line to valve No. 4. Reinstall valve No. 5.

h. Open valves Nos. 5 and 1.

i. Remove pinch from liquid line.

j. Evacuate liquid line. Close valve No. 4.

k. Re-flare tubing this side of pinch in tubing, and reconnect liquid line to valve No. 4.

l. Purge liquid line.

m. Test for leaks.

n. Open valves Nos. 3 and 4 and put system into operation.

Service Operation No. 19. Adjusting the Low Pressure Control.

(Instruction and illustrations on several makes of low pressure controls are given in Chapter 6.)

a. To lower the pressure in the crankcase and low pressure bellows, close valve No. 1 and use it as a throttle valve. On the majority of controls, the cutting-out point is set first. By restricting the gas passage at valve No. 1 the compressor will quickly reduce the pressure to the cutting-out point, so that an adjustment may be made.

b. To set the cutting-in point, open valve No. 1 and allow the pressure from the evaporator to increase the low pressure control pressure to the cutting-in point.

c. If the evaporator is extremely cold, and the evaporator pressure is insufficient to obtain the cutting-in point, close valve No. 1 and open valve No. 7. Then crack very slightly valve No. 6, and the high side pressure will increase the low side pressure to the cutting-in point of the control.

d. When adjustments have been made, open valve No. 1 and close valves Nos. 7 and 6.

Service Operation No. 20. Changing Stuffing Box Seal.

a. With compressor idle, close valve No. 1.

b. Note pressure on compound gauge. If above 0 lb., revolve flywheel by hand to reduce pressure to 0 lb.

c. If pressure is below 0 lb., increase to 0 lb. by by-passing through gauge set.

d. Close valve No. 2.

e. Remove flywheel from shaft.

f. Remove present stuffing box seal and inspect shaft.

Note: (Full instructions on stuffing box seals and shafts are given in Chapter 4, paragraph 55.)

g. Install new stuffing box and reinstall fly wheel.

h. By-pass pressure from cylinder head through gauge set, to crank case and test for leaks around stuffing box.

i. Open valves Nos. 1 and 2.

j. Operate compressor at around 5 lbs. back pressure for at least 15 minutes.

Note: (If dealing with an SO_2 or isobutane system and pressure goes below 5 lbs., open valves Nos. 7 and 6 just enough to keep pressure up to around 5 lbs.)

k. After running unit for 15 minutes, stop compressor, close valve No. 1, by-pass through gauge set to 35 lbs. pressure in the crankcase. Test for leaks.

l. Close valves Nos. 7 and 6, open valve No. 1, and put system into operation.

Service Operation No. 21. Changing the Low Pressure Control.

(If control is connected into crankcase as in Fig. 2, proceed as follows:)

a. Proceed as in steps a, b, c, d, in Operation 20.

b. Disconnect low pressure sylphon line and connect the new one.

c. Test for leaks, open valve No. 2.

d. Check adjustments on new control as in operation 19.

(If control is connected into tee installed in gauge part of valve No. 1, proceed as follows:)

a. Back seat valve No. 1.

b. Remove present line and install new one.

c. Crack valve No. 1 off the back seat and test for leaks.

d. Check adjustments as in operation 19.

Service Operation No. 22. Changing the Complete Condensing Unit.

a. Evacuate liquid line.

b. Evacuate suction line.

c. With valves Nos. 3, 4, 5, 1, and 2 closed, disconnect liquid line from valve No. 3 and suction line from valve No. 1.

d. Remove present condensing unit and install new one in its place.

e. Reconnect liquid and suction lines.

f. Purge liquid and suction lines.

g. Test for leaks.

h. Open valves Nos. 3, 4, 5, 1, and 2, and put system into operation.

Service Operation No. 23. Discharging Condenser and Liquid Receiver.

This may be done as in operation No. 6, by continuing the purging until all the refrigerant has been discharged from the condensing unit. It is necessary in this case to close valves Nos. 1 and 3.

Service Operation No. 24. Pumping All Refrigerant from Condensing Unit Into Empty Refrigerant Cylinder.

a. Evacuate and remove the liquid line from valve No. 3.

b. Connect a line from valve No. 3 to service connection No. 8 and test for leaks.

c. Back seat valve No. 2 and remove line to gauge set from fitting in valve part.

d. Connect line from fitting in valve part No. 2 to empty refrigerant cylinder of ample capacity.

e. Close valve No. 2. Test line from valve No. 2 to cylinder for leaks. Open cylinder valve, all the way. Place cylinder, inverted, in container of iced or cold water.

f. Close valve No. 1.

g. Open valves Nos. 3 and 6, using valve No. 6 as a throttle valve, and put compressor into operation.

(*Continued on Page 11, Column 1*)

INFORMAL TALK NUMBER 25

R-A-C-I Training—Always A Bull's Eye Hit

R-A-C-I Training goes right to the heart of the "why" as well as the "how" of refrigeration and air conditioning work. You can't stump R-A-C-I Trained Men. They never depend on guess-work or hit-or-miss experience for they are practical men who know of all the phases of installation and service work.

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Service Operations On Type 1A Systems

(*Concluded from Page 10, Column 5*)

h. With the compressor in operation, the refrigerant will be drawn out through valve No. 3 through valve No. 6, down through valve No. 1 and forced through the compressor, through valve No. 2, into the empty refrigerant cylinder, where by contact with the cold or iced water, the gas will condense in the cylinder.

Operation 24

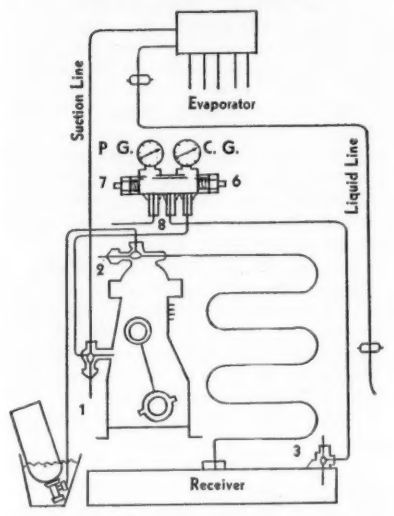

Fig. 142 shows connections made to pump refrigerant from condensing unit into empty refrigerant cylinder.

i. Continue operating the compressor at around 5 to 10 lbs. back pressure until all the refrigerant has been pumped from the condenser and liquid receiver. *Keep the cylinder in cold water at all times.*

j. During this operation it is likely that the liquid receiver will frost up. The operation may be speeded up by applying heat from a blow torch to the frosted part of the liquid receiver to keep it warm. Do not get the receiver hot.

k. When a vacuum has been drawn on the receiver and condenser and it is completely defrosted, stop the compressor.

l. Remove the cylinder from the water and close the cylinder valve. Back seat valve No. 2 and remove line to cylinder.

m. Reconnect high pressure gauge to valve No. 2, and crack valve No. 2 off the back seat.

n. Open valve No. 7, so that pressure in cylinder head may be bypassed into crankcase, liquid receiver and condenser. If pressure in head is not sufficient to bring pressure up to 0 lb., crack valve No. 1 and allow pressure from evaporator to build up pressure in condensing unit to 0 lb. Then close valve No. 1.

o. Close valves Nos. 7, 6, 3, and 2. Disconnect line from valve No. 3 to connection No. 8 and cap connection No. 8.

p. As the condensing unit now stands there is 0 lb. pressure in all parts, including crankcase, cylinder head, condenser and liquid receiver, and any one or all of these parts may be removed for repairing or replacing without any loss of refrigerant to the atmosphere.

Service Operation No. 25. Pumping Refrigerant from Entire System Into Empty Refrigerant Cylinder Or Evacuating Entire System.

a. Back seat valve No. 2.

b. Remove high pressure gauge line from fitting in valve No. 2.

c. Connect empty refrigerant cylinder to fitting in valve No. 2 as in operation 24.

d. Close valve No. 2.

e. With valves Nos. 1, 3, 4, and 5 open, put compressor into operation.

f. Continue to operate compressor until a vacuum is obtained on the entire system as will be noted on the compound gauge.

Operation 25

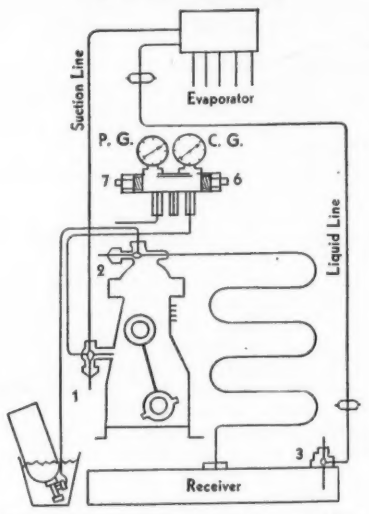

Fig. 143 demonstrates method used for pumping refrigerant from entire system into an empty refrigerant cylinder, or evacuating the entire system.

g. Close the cylinder valve and immediately stop the compressor.

h. If the vacuum is to be left on the system, back seat valve No. 2.

i. If any part of the system is to be opened for repair, immediately after stopping the compressor note pressure on the compound gauge. It should be below 0 lb. Crack the cylinder valve and open valve No. 2 allowing the pressure to build up to 0 lb. on the entire system. Then close the cylinder valve and back seat valve No. 2.

j. Remove the line to the cylinder and reconnect pressure gauge line to valve No. 20. Crack valve No. 2 off the back seat.

k. As it now stands, there is 0 lb. pressure in every part of the system, and any or all parts may be removed for repair or replacing without any loss of refrigerant or without taking air into the system.

Service Operation No. 26. Adding Liquid Refrigerant to Condenser And Liquid Receiver.

(In some cases it is an advantage and a saving of time, where a large quantity of refrigerant is to be added or where a complete charge is to be put in the system, to charge the refrigerant as a liquid. In such cases it is recommended that only a known required quantity of refrigerant be contained in the charging cylinder, then proceed as follows:)

a. Connect the refrigerant cylinder by means of a line to service connection No. 8.

b. Stop the compressor and allow the condenser to cool to room temperature.

c. Invert the refrigerant cylinder, and fix it securely so that it will not fall and break the charging line.

d. Purge the charging line and test for leaks.

e. Open the cylinder valve.

f. Open valve No. 7.

g. Move valve No. 2 at least two turns away from the back seat.

h. The liquid refrigerant will flow slowly from the cylinder, through the gauge set, through valve No. 2 and into the condenser and receiver.

i. After the refrigerant has started flowing, apply heat to the cylinder to keep it warm—*not hot,* and the increased pressure in the cylinder will cause the liquid to flow rapidly to the condenser and receiver, until the cylinder is completely emptied of liquid.

Operation 26

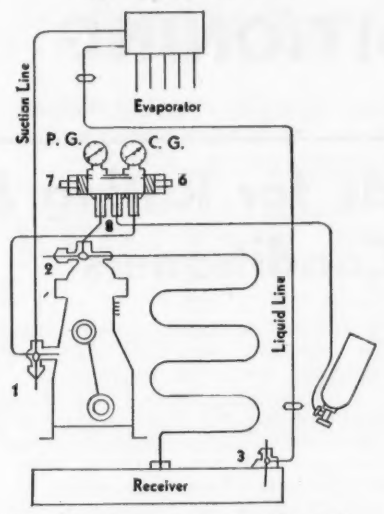

Fig. 144 shows how liquid refrigerant is added to the condenser and liquid receiver.

j. Remove the source of heat.

k. Close the cylinder valve.

l. Close valve No. 7.

m. Open valve No. 6 and the pressure from the charging line will be admitted to the low side.

n. Close valve No. 6, and remove the charging line. Cap outlet No. 8, and put the system into operation.

Home Appliance Service Co. To Handle Lipman Line

GREENSBORO, N. C.—Home Appliance Service Co., here, will handle Lipman equipment in this and adjacent counties, reports D. G. Fifield, sales promotion manager of General Refrigeration Sales Co.

49 Dairy Prospects Listed At Mid South Fair

MEMPHIS, Tenn.—Forty-nine prospects for dairy equipment and 516 prospects for various appliances were obtained by Arthur Fulmer, Kelvinator dealer, by installing a milk-cooling exhibit in the electrical tent of the Mid South Fair held here recently.

Mr. Fulmer obtained these prospects from among the 3,312 persons registered at the show, who came from the states of Tennessee, Arkansas, and Mississippi.

Astrologer Featured during Dealer's 62nd Anniverary

INDIANAPOLIS — Pearson Co., Crosley dealer here, engaged Madame Richey, astrologer, to attract prospects to its store during its sixty-second anniversary week. Kiefer Stewart Co., Crosley distributors in this territory, arranged this promotion feature.

Madame Richey spent two weeks previous to this engagement at the Wurlitzer Co. in Cincinnati, and two weeks in the Dayton Wurlitzer store.

First 6 Chapters of Master Service Manual Now Available in 112-page Booklet

Published in this issue is Chapter 9, Instalment 6 ("Service of Refrigerators") of the Master Service Manual, prepared by K. M. Newcum. The manual is being published serially in Electric Refrigeration News, the first instalment appearing in the April 10, 1935, issue. When all the chapters have been published in the News, the information will be put in book form, with considerable supplementary material.

This manual of information on the design and operation of present-day refrigeration systems will add to the service man's knowledge, and will assist him in meeting specific problems in servicing operations in the field.

Our supply of some of the back issues has been sold out. In order to meet the demand for the complete series we make the following offers to service men:

(1) Send $3.00 for a year's subscription to Electric Refrigeration News to start Aug. 28, 1935, and we will send reprints of all previous Newcum articles (the first six chapters of the book) in pamphlet form (size 6¼x8¾ inches).

(2) Send your advance order for a copy of the Master Service Manual, enclosing $3.00 to pay for the complete book, when published, and we will send you free of charge, reprints of all the Newcum articles published in the News up to and including Aug. 21, 1935. These reprints are in pamphlet form size 6¼x8¾ inches).

Following is an outline of the subjects and the dates of the weekly issues of Electric Refrigeration News in which the material was published:

Chapter 1—THEORY OF REFRIGERATION (April 10).

Chapter 2—PRINCIPLES OF MECHANICAL REFRIGERATION (April 17).

Chapter 3—COMMON REFRIGERANTS (April 24).

Chapter 4—CONDENSING UNITS.

Instalment 1: description of various compressor parts (May 1).

Instalment 2: stuffing box seals, flywheels, and direct-connected units (May 8).

Instalment 3: rotary compressors (May 29).

Instalment 4: care and servicing of shut-off valves and gaskets (June 5).

Instalment 5: condensers (June 12).

Instalment 6: liquid receivers (June 19).

Chapter 5—EVAPORATORS.

Instalment 1: flooded evaporators with low side float valve (June 26).

Instalment 2: high side float valves and flooded evaporators (July 3).

Instalment 3: automatic expansion valves (July 10).

Instalment 4: automatic expansion valves —continued (July 17).

Instalment 5: thermostatic expansion valves (July 24).

Chapter 6—CONTROLS.

Instalment 1: low pressure controls (July 31).

Instalment 2: low pressure controls—continued (Aug. 7).

Instalment 3: thermostatic controls (Aug. 14).

Instalment 4: thermostatic controls—continued (Aug. 21).

Chapter 7—MOTORS.

Instalment 1: repulsion start-induction run motors (Aug. 28).

Instalment 2: repulsion start-induction run motors (continued) and capacitor motors (Sept. 4).

Instalment 3: direct current motors and belts (Sept. 11).

Chapter 8—INSTALLATION

Instalment 1: installation of refrigerators (Sept. 18).

Instalment 2: correct use of fittings in making joints (Sept. 25).

Chapter 9—SERVICE.

Instalment 1: classification of systems and use of combination gauge set (Oct. 16).

Instalment 2: service complaints and remedies on Type 1A flooded systems (Oct. 23).

Instalment 3: service complaints and remedies on Type 1A flooded systems —continued (Oct. 30).

Instalment 4: service operations on type 1A flooded systems (Nov. 6).

Instalment 5: service operations on type 1A flooded systems—continued (Nov. 13).

Instalment 6: service operations on type 1A flooded systems—concluded (Nov. 20).

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AIR CONDITIONING

Standard Methods for Rating & Testing Air Conditioners

Leading technical and trade associations have cooperated in the formulation of "Standard Methods for Rating and Testing Air Conditioning Equipment," part of which is published on this and the following page.

The American Society of Refrigerating Engineers, American Society of Heating and Ventilating Engineers, Air Conditioning Manufacturers' Association, Refrigerating Machinery Association, and the Refrigeration Division of the National Electrical Manufacturers Association, were represented on the Joint Committee sponsoring these Standards, which have had the formal approval of the trade associations.

The Standards, which may be subject to some further minor revision, represent the collaboration and best thought of the leading air-conditioning technicians. The work is broad and exhaustive, and the Joint Committee believes it will prove of incalculable value to the makers and users of air-conditioning equipment.

These Standards are applicable to both summer and winter air conditioning.

INDEX

A. Scope
B. Classification
C. Ratings
D. Instruments and Apparatus
E. Testing Cooling Equipment
F. Testing Heating Equipment
G. Testing Humidifying Equipment
H. Definitions.

SCOPE

A. *Scope.* These standards prescribe the methods of rating and testing air conditioning and air treating units of the forced convection type.

CLASSIFICATION

B. *Classification* of air conditioning and air treating units will be as follows:

1. Free delivery type.
2. Pressure type.
3. Interchangers.

Rating

C. *Rating* of air conditioning and air treating units shall be given in terms of the effects produced on air when it is treated under the conditions specified in the Standard Basis of Rating.

1. *Standard Basis for Rating.* Units shall be rated for one or more air velocities through the unit. The air velocity must be held constant during the test for each rating. The conditions of temperature and pressure which are standardized and maintained constant for tests and rating purposes are given in Table 1.

a. Comfort Cooling with Volatile Refrigerant. The temperature of the inlet air to the cooler shall be 80° F. and the relative humidity shall be 50 per cent. The temperature of the refrigerant in the cooler shall be 40° F. and is taken as the saturation temperature corresponding to the pressure at the outlet connection of the cooling unit. The temperature of the liquid refrigerant entering the cooling unit shall be 90° F. The cooling unit must be operated so that liquid refrigerant does not flood out through the suction connection. In order to eliminate this possibility, refrigerant vapor leaving the cooling unit should be super-heated. The actual temperature of the suction refrigerant vapor at the outlet connection of the cooling unit shall be measured and given in the rating.

b. Comfort Cooling with Non-Volatile Refrigerant. The temperature of the inlet air to the cooler shall be 80° F. and the relative humidity shall be 50 per cent. The refrigerating medium shall enter the cooling unit at a temperature of 40° F. and shall flow at the average of the rates intended in the normal operation of the unit. The rate of flow and the outlet temperature of the refrigerant shall be reported in the test results.

c. Commercial Cooling with Volatile Refrigerants. The temperature of the inlet air to the cooler shall be 45° F. and the relative humidity shall be 85 per cent. The temperature of the refrigerant in the cooler shall be 30° F. and is taken as the saturation temperature corresponding to the pressure at the outlet connection of the cooling unit. The temperature of the liquid refrigerant entering the cooling unit shall be 90° F. The cooling unit must be operated so that liquid refrigerant does not flood out through the suction connection. In order to eliminate this possibility the refrigerant vapor leaving the cooling unit should be superheated. The actual temperature of the suction refrigerant vapor at the outlet connection of the cooling unit shall be measured and given in the rating.

d. Commercial Cooling with Non-Volatile Refrigerant. The temperature of the inlet air to the cooler shall be 45° F. and the relative humidity shall be 85 per cent. The refrigerating medium shall enter the cooling unit at a temperature of 30° F. and shall flow at the average of the rates intended in the normal operation of the unit. The rate of flow and the outlet temperature of the refrigerant shall be reported in the test results.

e. Heating with Steam. The temperature of the inlet air to the heater shall be 70° F. The steam entering the heater shall be at a pressure of 16.7 lbs. per sq. in. absolute, corresponding to a saturation temperature of 218.5° F. and shall be superheated at least 2° F. to insure its dryness. The actual temperature of the steam entering the heater and that of the condensate leaving the heater shall be measured and reported in the test results.

f. Heating with Liquid. The temperature of the inlet air to the heater shall be 70° F. The heating liquid shall enter the heater at a temperature of 180° F. and leave the heater at a temperature of 160° F.

g. Humidifying. The temperature of the air entering the humidifier shall be 70° F. and the relative humidity 30 per cent.

Items Required in Rating

2. *Items Required in Rating.* The rating of a unit shall include all of the following items which apply to the functions of the unit. In the presentation each combination of functional elements may be rated as a separate unit, or the rating may be given for a stated combination of elements and variations shown for the omission or inclusion of other elements. All rating data shall be corrected to the Standard Basis of Rating in the manner prescribed in the section on computations.

a. Name of Unit ("air-conditioning unit," "heating unit," "humidifying unit," etc.) shall signify the functions of the unit and shall not imply more functions than the unit is designed to perform. For example, the name "air-conditioning unit" shall not be applied to one which is not designed to embody the minimum complement of functions as defined in paragraph H3.

b. Functions which each unit performs must be designated. For example, the unit must be designated to perform one or more of the following functions: ventilation, air circulation, cooling, heating, dehumidifying, humidifying, filtering, and washing.

c. Data on Air Flow.

(1) Air delivered by the unit at each fan speed and air resistance. Air delivered shall be measured in c.f.m. of Standard Air as defined herein. If the air delivered for heating and cooling differs, both values shall be stated. If the ventilation air capacity is less than the total air flow this fact should be noted and the quantity separately stated.

(2) Fan motor power input for free delivery units, in watts.

(3) Fan power consumption for pressure type units, in which the available static pressure for external elements depends upon the fan speed, and the air resistance of the unit, shall be shown as indicated in Table 2.

Table 1. Standard Basis for Rating

Function	Medium	Rating Range	Air Entering Temp.	Air Entering Rela. Hum.	Fluid Temperature In	Fluid Temperature Out	Fluid Temperature Sat. Refrig. Vapor
Cooling	Volatile Refrigerant	Comfort	80° F.	50%	90° F.	...	40° F.
		Commercial	45° F.	85%	90° F.	...	30° F.
	Non-Volatile Refrigerant	Comfort	80° F.	50%	40° F.	...	..
		Commercial	45° F.	85%	30° F.	...	..
Heating	Steam		70° F.	..	218.5° F.	...	..
	Liquid		70° F.	..	180° F.	160° F.	..
	Other		70° F.	..	..	...	..
Humidifying			70° F.	30%	..	...	..

Table 2. Fan Performance

Type X Unit—2,000 C.f.m.

Motor Horsepower	¼	½	¾
Brake hp. output of motor	0.26	0.48	0.78
Total fan static pressure (in. water gauge)	0.40	0.82	1.25
R.p.m. of fan	650	800	950

(4) Air resistance as shown in Table 3 shall be for the air quantity and conditions on which the capacity ratings are based.

The external static pressure available is the difference between the static resistance of the unit and the total static pressure of the fan selected according to the horsepower used. *The general form of the table shown is to be followed, but the number and magnitude of the figures is given for illustrative purposes only.* At least three fan speeds must be shown for each unit.

d. Data on Cooling.

(1) Total cooling effect in B.t.u. per hour.

(2) Sensible cooling effect in B.t.u. per hour.

(3) Dehumidifying effect in B.t.u. per hour.

(4) Name of refrigerant or refrigerating medium for either volatile or non-volatile refrigerant and for surface or spray interchanger. If a brine is used, its composition, density, and specific heat should be stated.

(5) Temperature of volatile refrigerant vapor leaving the unit.

(6) Temperature and pressure of volatile refrigerant liquid entering the refrigerant control.

(7) Temperature of non-volatile refrigerant leaving the unit for either spray or surface interchanger.

(8) Quantity of non-volatile refrigerant circulated in gallons per minute for either surface or spray interchanger.

(9) Pressure drop of non-volatile refrigerating medium when surface interchanger is used, in lbs. per sq. in., between the inlet and outlet connections of the unit for the stated flow.

(10) Power consumption of non-volatile refrigerant pump for either cooling spray or surface interchanger, in horsepower output of pump motor where pump is regularly supplied as part of the unit.

(11) Spray pressure for cooling spray in lbs. per sq. in. gauge. When liquid is supplied directly from the mains, or a pump is required but not supplied with unit, state the quantity of liquid sprayed in gallons per minute.

e. Data on Heating.

(1) Heating effect, in B.t.u. per hour.

(2) Heating medium, liquid or vapor.

(3) Temperature of steam to heater, in degrees F.

(4) Temperature of condensate from heater, in degrees F.

(5) Pressure drop across interchanger for liquid heating in lbs. per sq. in.

(6) Power consumption of liquid pump, if one is required, in horsepower output of pump motor.

f. Data on Humidification.

(1) Humidifying effect in lbs. of water evaporated per hour. When this effect is influenced by an air heater which may be on or off, ratings shall be given for both conditions.

(2) Total water consumption for humidifying in lbs. per hour.

(3) Source and amount of heat for humidifying when heat is required in addition to that of the entering air, in B.t.u. per hour. All pertinent information relating to the source of heat, such as stream pressure, hot water temperature, voltage, etc., shall be given.

(4) Power consumption of spray pump for humidifying spray, in horsepower output of pump motor where pump is regularly supplied as part of the unit.

(5) Spray pressure for humidifying spray or surface humidifier in lbs. per sq. in. gauge. When water is supplied directly from mains, or pump is required but not supplied with the unit, state the quantity of water sprayed in gallons per minute.

(6) Temperature of water entering the unit shall be stated.

Rating Tolerance

3. *Rating Tolerance.* In view of inequalities in manufacture, a variation of plus or minus 4 per cent between the performance of a given unit and the rating of that unit will not be considered excessive.

Instruments and Apparatus

D. *Instruments and Apparatus* for all tests shall be selected from the types listed below and shall have the accuracy limits specified.

1. *Instruments.*

a. Temperature Measuring Instruments.

(1) Temperature measurements shall be made with one or more of the following instruments: (a) Mercury-in-glass thermometers, (b) Thermocouples, (c) Electric resistance thermometers.

(2) Accuracy shall be within the following limits: (a) Wet and dry bulb temperatures, plus or minus 0.1° F. (b) Non-volatile refrigerant temperatures, plus or minus 0.1° F. (c) All other temperatures, plus or minus 0.5° F.

b. Pressure Measuring Instruments.

(1) Pressure measurements shall be made with one or more of the following instruments. (a) Mercury column. (b) Bourdon tube gauge.

(2) Accuracy shall be within the following limits: (a) Suction pressure, absolute, plus or minus 1 per cent. (b) Closed interchanger liquid pressure drop, plus or minus 0.1 inch of mercury. (c) Other pressures, absolute, plus or minus 2 per cent.

c. Air Capacity Measuring Instruments.

(1) Air capacity measurements shall be made with a manometer (draft gauge) used in conjunction with a nozzle. The nozzle shall be as specified in the A.S.H.V.E. Standard Code for Testing and Rating Steam Unit Heaters.

(2) Accuracy shall be as follows: the nozzle coefficient shall be determined within 1 per cent and the manometer (draft gauge) shall be capable of being read to within 0.005 inch of water.

d. Electrical Measuring Instruments.

(1) Electrical measurements shall be made with one or more of the following instruments: (a) Indicating. (b) Integrating.

(2) Accuracy shall be within the following limits: (a) Indicating instruments within 0.5 per cent. (b) Integrating instruments within 1 per cent.

e. Refrigerant Flow Measuring Instruments.

(1) Volume measurements shall be made with one or more of the following instruments: (a) Liquid refrigerant quantity meter. (b) Liquid refrigerant flow meter.

(2) Accuracy shall be within plus or minus 1 per cent.

f. Brine or Water Flow Measuring Instruments.

(1) Volume measurements shall be made with one or more of the following instruments: (a) Liquid quantity meter, measuring either weight or volume. (b) Liquid flow meter.

(2) Accuracy shall be within plus or minus 1 per cent.

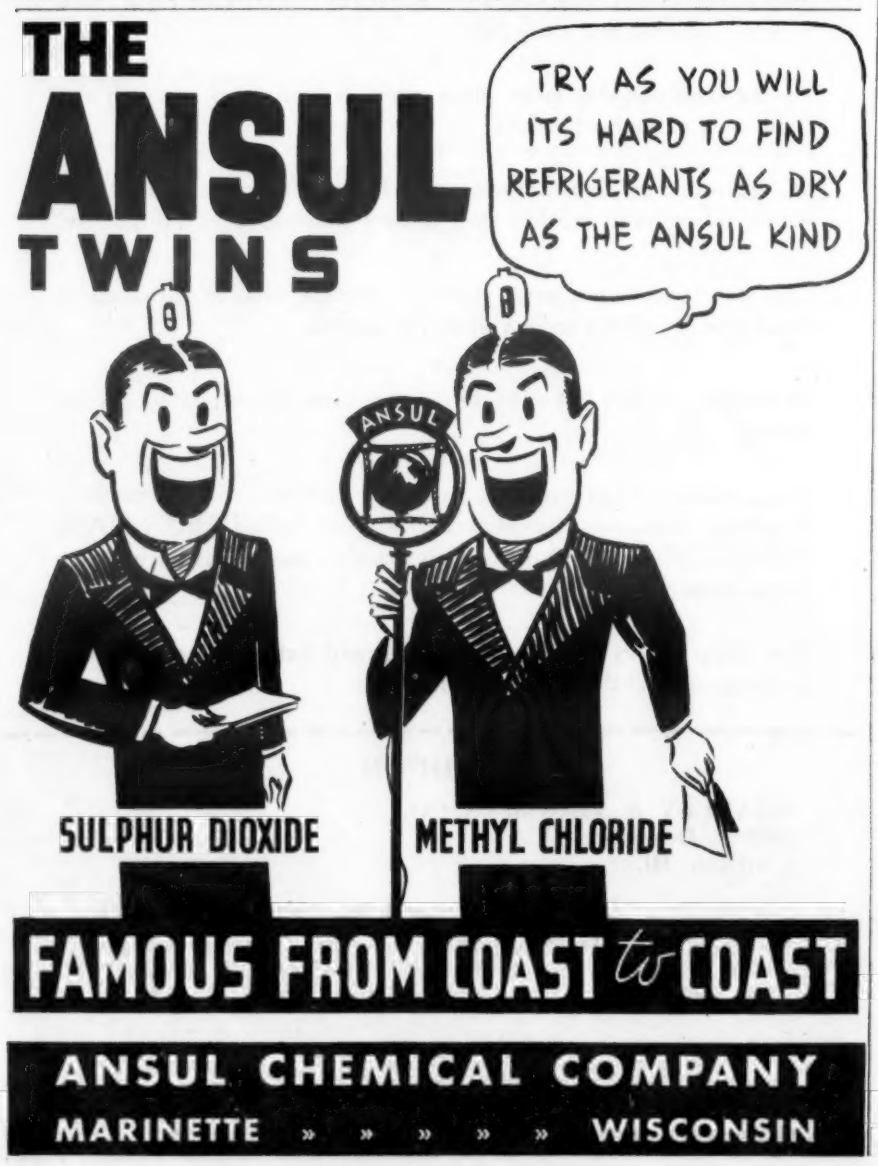
g. Speed Measuring Instruments.

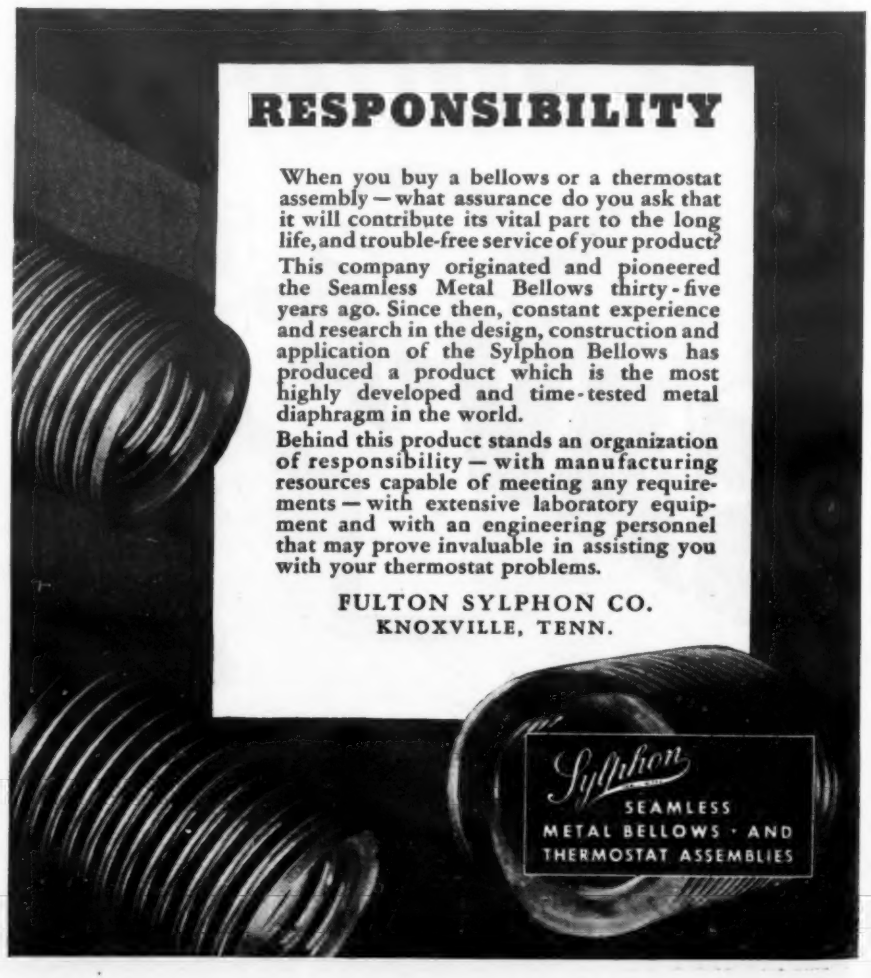
(1) Speed measurements shall be made with one or more of the following instruments: (a) Revolution

(*Continued on Page 13, Column 1*)

Table 3. Air Resistance of Unit

Assembly No.	Parts Included	C.F.M.	Static Pressure Loss (Inches Water Gauge)
X-1	Cooling; heating; filtering		0.5
X-2	Cooling; filtering		0.40
X-3	Heating; filtering		0.27
X-4	Cooling only		0.25
X-5	Heating only		0.15

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SEAMLESS
METAL BELLOWS · AND
THERMOSTAT ASSEMBLIES

Standard Tests for Air Conditioners

(*Continued from Page 12, Column 5*)

counter. (b) Tachometer. (c) Stroboscope. (d) Oscillograph.

(2) Accuracy shall be within plus or minus 0.25 per cent.

h. Brine specific gravity shall be read with a hydrometer accurate to within 1 per cent of specific gravity read.

i. Time measurements shall be made with apparatus whose accuracy is within plus or minus 0.1 per cent.

j. Weight measurements shall be made with apparatus whose accuracy is within plus or minus 0.2 per cent.

Air Measurement Apparatus

2. *Apparatus for Air Measurements.*

a. Receiving Chamber with Impact Nozzle. The principle of this method, which is specified in the A.S.H.V.E. Standard Code for Testing and Rating Steam Unit Heaters, is to measure the velocity pressure at the throat of a calibrated nozzle placed between a receiving and a discharge chamber, and the temperature and moisture changes between the inlet to the air-conditioning unit and the discharge from the nozzle by means of wet and dry bulb temperature measuring instruments. See Fig. 1.

(1) Chamber for receiving and mixing the air discharged from the unit is to be constructed. It shall be well insulated with 2 in. of cork or equivalent and sealed, if possible, so that air leaking at any static pressure within the range of the tests shall not exceed 1 per cent of the total air flow. In no case shall the leakage be greater than 5 per cent. If leakage is over 1 per cent, the chamber shall be calibrated for leakage at various static pressures covering the test range. The chamber shall be of such a size that the unit to be tested will produce from 20 to 90 air changes per minute.

(2) The outlet or outlets of the unit to be tested shall be joined directly to the receiving chamber without a communicating duct.

(3) Two or more static orifices shall be located in the receiving chamber and not in the direct air blast from the unit. These openings shall be connected by air-tight tubes to a common manometer (draft gauge) which can be read to 0.005 inches of water.

(4) A calibrated nozzle shall be fitted into one wall of the chamber, discharging into the duct leading to the exhaust fan. The outlet opening of this nozzle shall be of such area that the air velocity is not less than 3,000 feet per minute.

(5) An exhaust fan shall be connected to the discharge chamber and shall be of such capacity that it will overcome the resistance of the receiving chamber, the discharge duct, and of the nozzle. It shall be able to provide a zero static pressure at the outlet of area delivery units.

(6) Two manometers (draft gauges) in parallel shall be provided for measuring pressures at the nozzle. One side of each manometer shall be connected to a static orifice located flush with the inner fall of the exhaust duct and near the chamber wall. The other sides shall be connected to an impact tube arranged to measure the velocity pressure of the air in the nozzle outlet.

(7) Wet and dry bulb temperature measuring instruments shall be paired and shall be located at the center of equal areas. Temperature measuring instruments shall be located to measure the initial and final dry and wet bulb temperatures. At least one pair shall be used for each sq. ft. of inlet area and outlet nozzle throat area, but in no case shall less than four pairs be used. All temperature measuring instruments shall be calibrated and when exposed to radiant heat shall be shielded therefrom.

Receiving Chamber with Static Nozzle

b. Receiving Chamber with Static Nozzle. The principle of this method is substantially the same as that of the Receiving Chamher Method with Impact Nozzle except that the receiving chamber is much larger so that the velocity pressure of the air approaching the nozzle is reduced to a neglible amount and consequently only static pressure drop need be measured, and the instruments for measuring the temperature leaving the unit are located at the discharge of a mixing box connected to the discharge of the unit rather than at the nozzle. See Fig. 1.

(1) Chamber for receiving and mixing the air discharged from the unit shall be constructed as in "a" except that it shall be of such size that the unit to be tested will produce from 1 to 10 air changes a minute and it need not be insulated. If desired, a well gasketed door may be provided for entering the chamber. The area of the wall of the receiving chamber, perpendicular to the axis of air flow from the unit being tested, shall be such that the average air velocity shall not exceed 150 ft. per minute as calculated from the total air flow divided by the said wall area.

(2) The outlet of the unit to be tested shall connect to a mixing box placed over the unit outlet in which temperature measurements are made in restricted openings or nozzles. This box connects directly to one wall of the receiving chamber without a communicating duct.

(3) One or more calibrated nozzles shall be fitted into one wall of the receiving chamber and discharge into a discharge chamber. The nozzle velocity shall be not less than 2,000 ft. per minute. Multiple nozzles in parallel are recommended for high values of air quantity. Center-to-center distances between nozzles in use shall not be less than three throat diameters and the distance from the center line of any nozzle to any of the four adjacent side walls shall not be less than three throat diameters. If the nozzles are of different diameters the distance between axes shall not be less than three times the diameter of the larger throat.

(4) The possibility of any of the discharge air entering directly into the nozzle shall be minimized by locating the nozzle in a wall adjacent to the wall where the air enters the chamber, and at a different level. The average approach velocity shall not be greater than 3 per cent of the nozzle velocity and the maximum velocity. The approach velocity shall be defined as the average velocity of the air in the receiving chamber, as calculated by dividing the total air flow by the area of the wall of the receiving chamber, (in which the nozzle is located), which is perpendicular to the axis of the nozzle.

(5) The area of the wall on the discharge side of the nozzle shall be at least one-half the area of the chamber side of the same wall.

(6) The size and arrangement of the discharge chamber shall be such that pressure readings on the discharge side of the nozzle shall not be affected by air velocities affecting the readings more than 1 per cent. The distance from the nozzle to the nearest obstruction shall not be less than 10 orifice diameters, unless suitable diffusion plates or baffles are used.

(7) An exhaust fan shall be connected to the discharge chamber and of such capacity that it will overcome the resistance of the chambers, nozzle, and mixing box. It shall be able to provide a zero static pressure at the outlet of free delivery units. Means shall be provided with which to vary the capacity of the exhaust fan.

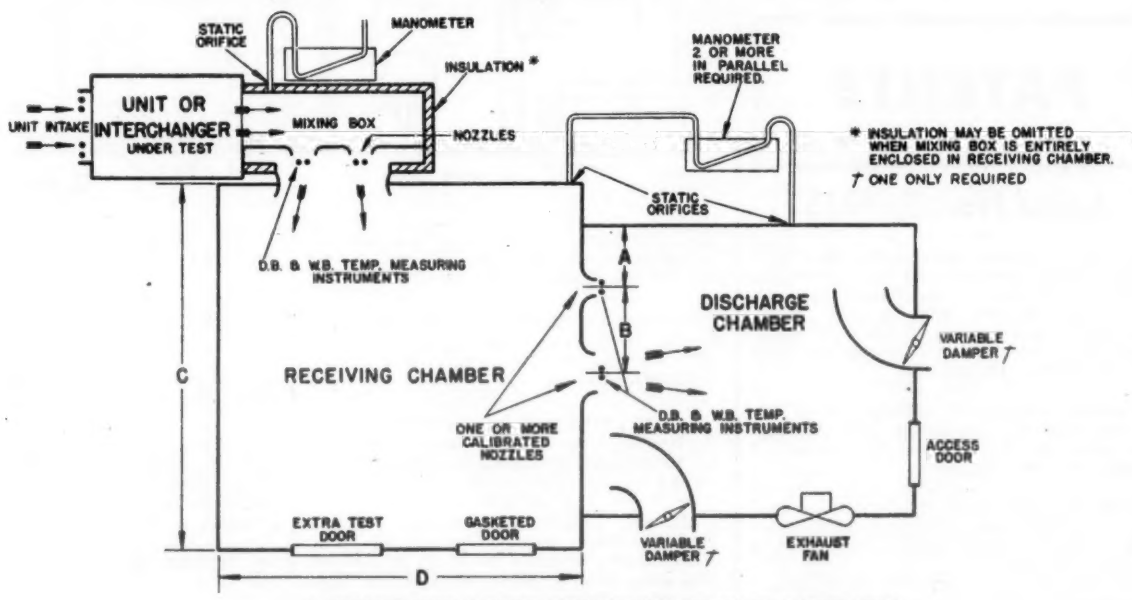
(8) A mixing box shall be constructed at the outlet of the air-conditioning unit and shall contain one or more static orifices not in the direct blast from the unit. These shall be connected by means of air-tight tubes to a common manometer (draft gauge).

(9) Two or more manometers (draft gauges) in parallel, having one side connected to a static orifice located flush with the inner wall of the re-

(*Concluded on Page 16, Column 1*)

Two Types of Apparatus for Measuring Air

RECEIVING CHAMBER STATIC NOZZLE METHOD



RECEIVING CHAMBER IMPACT NOZZLE METHOD

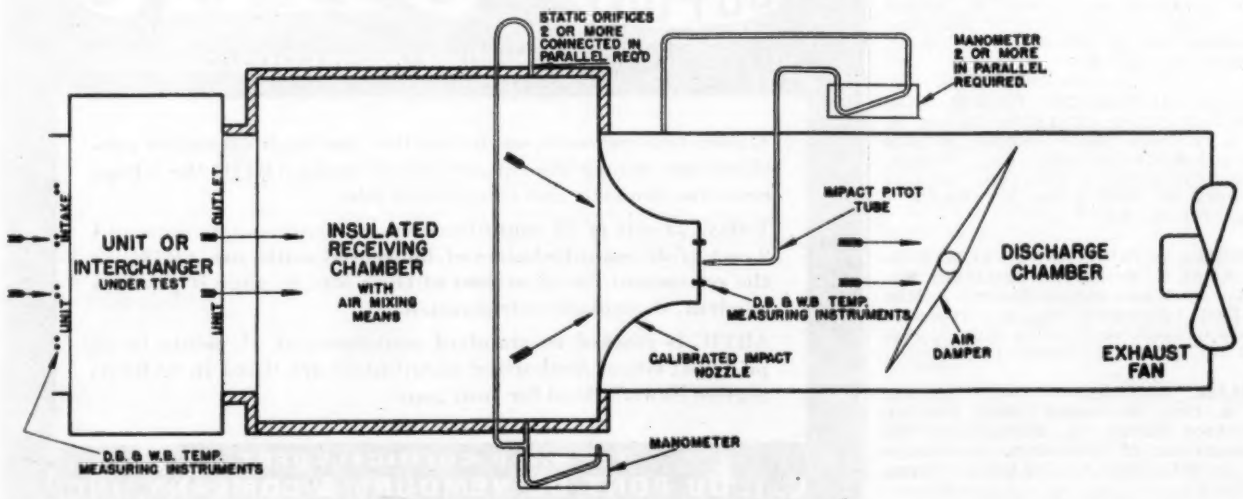
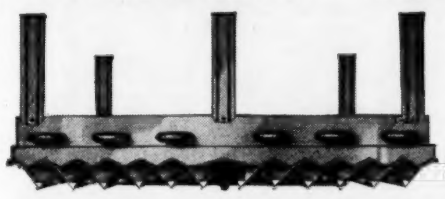


Fig. 1—The setup of apparatus for the static nozzle method of measuring air in the receiving chamber is shown in the upper section of the drawing while the equipment layout for the impact nozzle method is shown below.

BUYER'S GUIDE

MANUFACTURERS SPECIALIZING IN SERVICE TO THE REFRIGERATION INDUSTRY

PEERLESS FLASH COOLER



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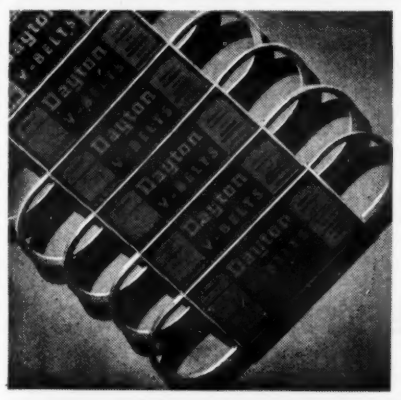

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TYPE KR— 12 MODELS

RANCOSTAT —the Stainless Steel Thermostat

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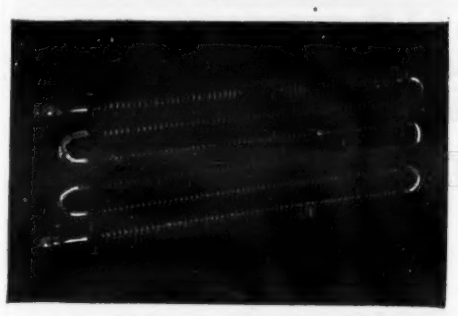
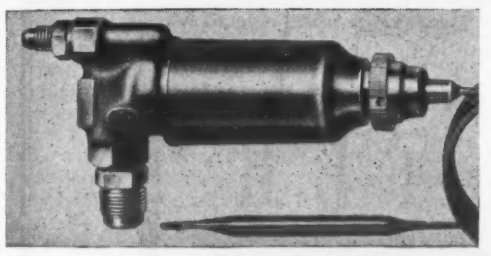


REMPE FIN COILS

CHICAGO STATION D

Pipe Coils and Bends

STANDARD REFRIGERATING APPLIANCES



THERMOSTATIC EXPANSION VALVES

Write for bulletin on complete line covering refrigerating appliances, liquid line filters, dehydrators, acid neutralizers, standard parts and materials, service tools, shaft seals, bearing metals and parts. Descriptive literature will be gladly furnished on any or all of these lines on request.

AMERICAN INJECTOR COMPANY 1481-14th. Street Detroit, Mich.

KRAMER UNIT COOLERS *Manifolded for* FREON

and greater than 20° air to refrigerant differentials.
Maximum Fin Coil Surface on 5/8" O. D. Tube.
All Copper. Casing Brass. Entirely non-corrosive.

COOLERS — EVAPORATORS — CONDENSERS — COOLING COILS

TRENTON AUTO RADIATOR WORKS

210 West 65th, N.Y.C. TRENTON, N.J. 5114 Liberty Ave., Pittsburgh, Pa.

CONDENSING UNITS AND COMPRESSORS FOR HOUSEHOLD REFRIGERATION BY

JOMOCO, INC.

A SUBSIDIARY OF THE JOHNSON MOTOR CO.

Waukegan, Ill.

CABLE ADDRESS: JOMOCO-WAUKEGAN

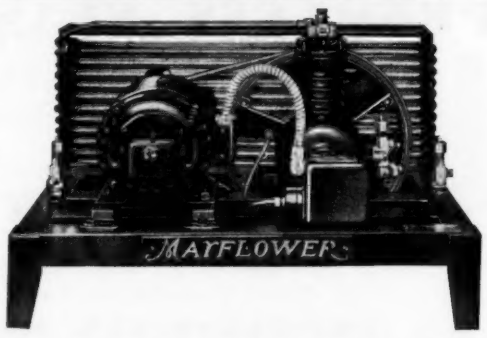
BUYER'S GUIDE

MANUFACTURERS SPECIALIZING IN SERVICE TO THE REFRIGERATION INDUSTRY

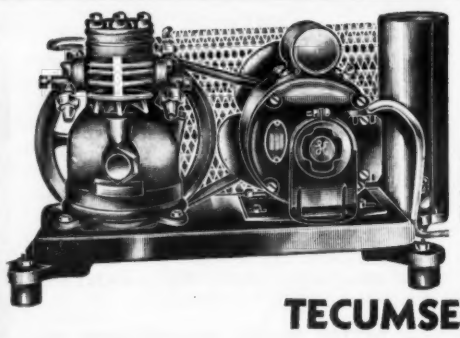
HARDY
"Mayflower" Compressors

exclusively manufactured for Commercial use, are the units which have long met with general approval.

For dependability and genuine satisfaction, dealers are recommending this equipment.



HARDY MANUFACTURING CO., Inc., 100 Davis Ave., Dayton, Ohio



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QUALITY-BUILT COMPRESSORS and CONDENSING UNITS

All bearings diamond bored. Positive lubrication of piston by newly developed process plus forced feed lubrication in all models.

Sizes: 1/6, 1/5, 1/4, 1/3 h.p.

Write for prices

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Tecumseh, Mich.

KOCH COMMERCIAL REFRIGERATOR CABINETS

All types and sizes of heavily insulated refrigerators and display cases.

WANTED— DISTRIBUTORS and SALES AGENTS

Attractive sales proposition. Some good territories available. Many exclusive features. Write for information, and submit your qualifications.

KOCH REFRIGERATORS, North Kansas City, Mo.

TYLER'S NEW WELDED STEEL REFRIGERATOR CASES

At last a general purpose case at a sensible price. Offers every advantage of the most costly cases at tremendous savings. Modern in every detail. Comes equipped with coils. Single and double duty models.

AN AMAZING VALUE

Hundreds in use. Every store and market a prospect. Home Equipment Company, Fort Wayne, Ind., sold nine cases in two weeks. Write or wire for all the facts.

TYLER *Sales Fixture* CO., Dept. E, Niles, Michigan

3 INCH INSULATION-TRIPLE GLASS

INTRODUCTION TO THE

MASTER

ELECTRIC REFRIGERATION

SERVICE

MANUAL

Containing only the first six chapters of the complete book to be published Jan. 1, 1936

BUSINESS NEWS PUBLISHING CO.
Publishers of
ELECTRIC REFRIGERATION NEWS

No need to wait longer—you can begin with the first six chapters immediately.

(See complete rates on page 15 of this issue)

FHA-Insured Loans Total $425,514,470 On October 31

WASHINGTON, D. C.—Business done by private lending institutions under the National Housing Act through Oct. 31 totaled $425,514,470, announces Stewart McDonald, Federal Housing Administrator. For October alone, the figures totaled $54,362,984.

This business was done in a period of the year which normally shows a seasonal decline, McDonald pointed out.

Individual totals are: modernization and repair notes insured, October, $27,163,130; to date, $194,877,984; mortgages selected for appraisal, October, $27,199,854; to date, $209,264,612; low cost housing mortgages accepted, to date, $21,514,874.

While the $425,514,470, all private capital, represents only notes and mortgages presented to the FHA for insurance, McDonald estimates it is less than half of the total amount of private capital used throughout the country in modernization and new construction generated by the government's interest in housing.

According to the Bureau of Labor Statistics, residential construction from March through September, this year, shows a monthly mean average gain of more than 169 per cent over the same period of 1934.

Supply Jobber Becomes Norge Dealer

JERSEY CITY, N. J.—The G-M Federal Plan Co., formerly an electrical supply jobber, has now entered the major appliance business here as a Norge dealer handling refrigerators, washers, ironers, ranges, and oil burners.

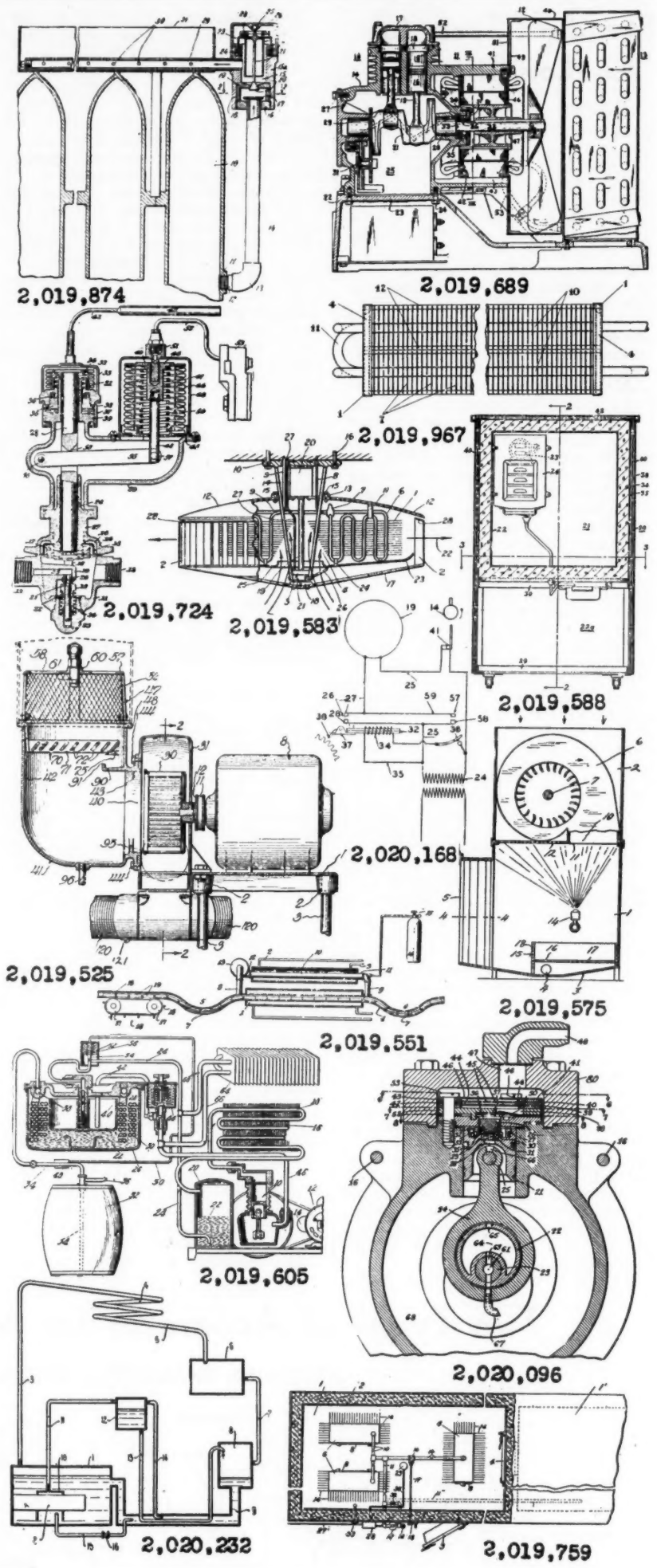
Westinghouse Purchases Mansfield Enameling Co.

MANSFIELD—Westinghouse Electric & Mfg. Co. has purchased the Mansfield Vitreous Enameling Co., and has started a program of expansion.

Ohio Carbon Issues Catalog On Motor Brushes

LAKEWOOD, Ohio—A loose-leaf pocket-size catalog containing data on carbon brushes used for refrigerator motors, electric fans, blowers, portable drills, and vacuum cleaners, has just been issued by Ohio Carbon Co.

The brushes include those for fractional horsepower motors for d.c. and single-phase repulsion-induction a.c. machines. The catalog is cross-indexed under both make of motor and uses.



PATENTS

Issued Nov. 5, 1935

2,019,525. COMBINED OIL BURNER AND AIR-CONDITIONING DEVICE. Harry L. Dooley, Rock Island, Ill., assignor to Modern Mfg. & Eng., Inc., Davenport, Iowa, a corporation of Iowa. Application Aug. 25, 1932. Serial No. 630,396. 7 Claims. (Cl 183—24.)

2,019,551. REFRIGERATING SYSTEM. Gordon Varney, Bradenton, Fla. Application June 16, 1931. Serial No. 544,802. 7 Claims. (Cl. 62—114.)

2,019,575. AIR CONDITIONER. George W. Langford, Ann Arbor, Mich. Application October 9, 1931. Serial No. 567,938. 8 Claims. (Cl. 261—117.)

2,019,583. AIR CONDITIONER. Clarke Redfield, Tenafly, N. J. Application July 30, 1934. Serial No. 737,537. 10 Claims. (Cl. 62—135.)

2,019,588. REFRIGERATING APPARATUS. Hugh Wallace, Dayton, Ohio, assignor, by mesne assignments, to General Motors Corp., a corporation of Delaware. Application Jan. 31, 1929. Serial No. 336,451. 2 Claims. (Cl. 220—9.)

2,019,605. AUTOMATIC CHECK FOR REFRIGERATING SYSTEMS. Robert H. Guyton, Chicago, Ill., assignor to The Brunswick-Balke-Collender Co., Chicago, Ill., a corporation of Delaware. Application April 18, 1933. Serial No. 666,698. 3 Claims. (Cl. 62—3.)

2,019,689. REFRIGERANT COMPRESSOR. Ralph E. Marbury, Wilkinsburg, Pa., assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., a corporation of Pennsylvania. Application July 7, 1933. Serial No. 679,406. 16 Claims. (Cl. 230—58.)

2,019,724. REFRIGERATING SYSTEM. Carl A. Otto, Milwaukee Wis., assignor to Johnson Service Co., Milwaukee, Wis., a corporation of Wisconsin. Application Sept. 1, 1934. Serial No. 742,495. 12 Claims. (Cl. 62—2.)

2,019,759. DRY ICE REFRIGERATION. Duncan McNeil, San Francisco, Calif., assignor to Chas. R. McCormick Lumber Co., San Francisco, Calif., a corporation of Delaware. Application Jan. 16, 1932. Serial No. 587,017. 3 Claims. (Cl. 62—91.5.)

2,019,874. HUMIDIFYING APPARATUS. George R. Siefken, New York, N. Y. Application Jan. 17, 1934. Serial No. 706,945. 3 Claims. (Cl. 237—78.)

2,019,967. HEAT EXCHANGER. Anthony F. Hoesel, Chicago, Ill. Application Feb. 11, 1935. Serial No. 5,977, 1 Claim. (Cl. 257—255.)

2,020,096. REFRIGERATION APPARATUS. Carl Oscar Bergstrom, Hyde Park, Mass., assignor to B. F. Sturtevant Co., Inc., Boston, Mass. Application Sept. 5, 1934. Serial No. 742,754. 9 Claims. (Cl. 230—190.)

2,020,168. ELECTRICAL CONTROL FOR VALVES. Robert T. Williams, Quincy, Ill., assignor to Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., a corporation of Delaware. Application Dec. 28, 1933. Serial No. 704,251. 9 Claims. (Cl. 172—239.)

2,020,232. REFRIGERATING APPARATUS. Alexander Bikkers, Scheveningen, Netherlands, assignor to N. V. Naamlooze Vennootschap Athano, Scheveningen, Netherlands, a company of the Netherlands. Application May 9, 1934. Serial No. 724,813. In Belgium May 11, 1933. 2 Claims. (Cl. 62—119.)

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(DU PONT METHYL CHLORIDE)

Stable, non-corrosive, easily handled and high operation efficiency are among the features which make ARTIC *the* refrigerant for domestic and commercial jobs.

Today, *22 out of 28* manufacturers of commercial units and *9 out of 30* manufacturers of household units use ARTIC as the refrigerant for all or part of their line, because it provides efficient, dependable refrigeration.

ARTIC is stocked in standard containers at 51 points in *43* principal cities. Authorized distributors are listed in "ARTIC Service News." Send for your copy.

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District Sales Offices: Baltimore, Boston, Charlotte, Chicago, Cleveland, Kansas City, Newark, New York, Philadelphia, Pittsburgh, San Francisco

BUYER'S GUIDE

MANUFACTURERS SPECIALIZING IN SERVICE TO THE REFRIGERATION INDUSTRY

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Thoroughly reinforced all steel attractively finished cabinets.

Different models of varying capacities.

Write for details and sales prices.

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Domestic--Commercial--Air Conditioning

100% WHOLESALE "We Protect the Dealer"

You can always depend on us for lowest prices and speedy service. Our big catalog showing **America's largest line** free to all legitimate dealers and service companies. Write today on your letterhead.

SEND FOR OUR BIG NET PRICE BARGAIN CATALOG

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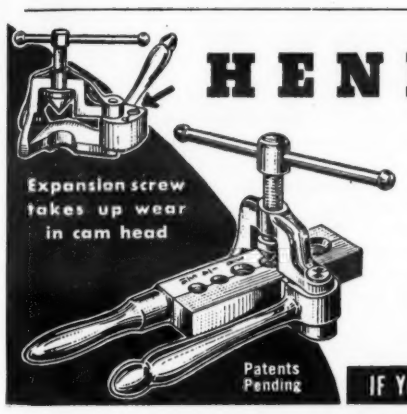

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The flaring tool that is the fastest and easiest to operate! Sturdy and lasts longer. Adjustable cam lever locks the tube in place in carbonized clamping blocks. Greatest locking pressure is always exerted directly opposite the tube. For ¼", 5/16", ⅜" ½" and ⅝" tubing. Each, $4.55.

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Electric Refrigeration News	United States and Possessions, and Pan-American Postal Union Countries	All Other Countries (except Canada)	Canadian Rates (including tariff of 5 cents per copy on the News)
1 subscription	$3.00	$5.00	$6.00
5 or more each	2.75	4.75	5.75
10 or more each	2.50	4.50	5.50
20 or more each	2.25	4.25	5.25
50 or more each	2.00	4.00	5.00
1935 Refrigeration and Air Conditioning Directory or 1935 Refrigeration and Air Conditioning Market Data Book or Master Electric Refrigeration Service Manual (to be published Jan. 1, 1936)			
1 copy	$3.00	$3.50	$3.50*
5 or more each	2.75	3.25	3.25*
10 or more each	2.50	3.00	3.00*
20 or more each	2.25	2.75	2.75*
50 or more each	2.00	2.50	2.50*
Combination Rates			
Electric Refrigeration News and all 3 books	$7.50	$10.00	$12.00*
Electric Refrigeration News and any 2 books	6.50	9.00	11.00*
Electric Refrigeration News and any 1 book	5.00	7.50	9.00*
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*Canadian subscribers are required to pay a tariff and excise tax on the Directory, Market Data Book, and the Master Service Manual of approximately 50 cents per book. These charges on books will be collected by the Canadian postoffice at the time of delivery.

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☐ Enter my subscription to Electric Refrigeration News for one year (52 issues). Enclosed find remittance.*

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☐ Enter my subscription to Electric Refrigeration News for one year (52 issues), and send me two of the above books. State which two (.....) Enclosed find remittance.*

☐ Enter my subscription to Electric Refrigeration News for one year (52 issues), and send me all three of the above books—the Directory, the Market Data Book, and the Master Service Manual. Enclosed find remittance.*

☐ Enter my advance order for the Master Service Manual, to be published about Jan. 1, 1936, and send me a free copy of the 112-page booklet containing the first six chapters as published in the weekly issues of Electric Refrigeration News from April 10 to Aug. 21, 1935. Enclosed find remittance.*

*See rates above.

Name .....

Attention or In care of .....

Street .....

City ..... State .....

Remarks .....

(Please indicate products sold or principal line of business.) 11-20-35

QUESTIONS

Evaporators and Valves

No. 2565 (Service Firm, Illinois)—"Will you please give me the address of the manufacturer of Mullins evaporators and the makers of Mayson expansion valves.

"I also would like the address of a manufacturer of electric refrigeration cabinets for domestic use, as I will use upwards of 200 cabinets this coming year."

Answer: Mullins evaporators are manufactured by Mullins Mfg. Co., South Ellsworth Ave., Salem, Ohio. Mayson expansion valves are made by the Mayson Mfg. Co., 4332 Horatio Ave., Detroit, Mich.

Manufacturers of cabinets for household electric refrigerators are listed starting on page 226 of the 1935 Refrigeration and Air Conditioning Directory.

List of Service Men

No. 2566 (Manufacturer, Ohio)—"Would you please advise where we can obtain a dependable list of service men, service companies, and also their addresses within the United States?"

Answer: You will find a list of independent refrigeration service men published in the 1935 Refrigeration and Air Conditioning Directory. Please note, however, that this list is not large and in no manner complete. As stated in the "Foreword" of the Directory:

"We make no claim to completeness in connection with this new section. Much time and effort has been expended in collecting information but these branches of the industry are still in the promising stage. In another year, perhaps, we may be able to furnish a more accurate and comprehensive directory of these service groups."

Saturation by Cities

No. 2567 (Advertising Agency, New York)—"We are anxious to obtain estimates of the number of electric refrigerators and other electric appliances sold or in use in places under 10,000 population. If estimates are not available, can you suggest a basis on which we might make estimates?"

Answer: See pages 207 to 259 in the 1935 Refrigeration and Air Conditioning Market Data Book. While this tabulation of statistics does not include *all* the cities in the United States under 10,000 population, the introduction does indicate a method whereby—given the city's population—an estimate for any particular city may be made.

Listing of Branch Plants

No. 2568 (Manufacturer, Michigan)—"It is the writer's desire to have a list of all electric refrigeration manufacturers whether it be domestic, commercial or important refrigeration parts manufacturers. I am told that you have such a list.

"Will you kindly investigate and advise what channels I might have to go through to secure this information, or if I have not made myself clear as to the list required, let me know and I will forward the necessary information.

"I might add that I would like to make a list, for instance, showing Norge Corp, with the executive offices in Detroit and their manufacturing division in Muskegon, the same as Kelvinator being located in Grand Rapids as well as in Detroit."

Answer: A complete list of refrigeration manufacturers is published in the 1935 Refrigeration and Air Conditioning Directory. The book is divided into four sections:

(1) Alphabetic list of manufacturers; (2) index of trade names; (3) classified list of refrigeration equipment; (4) geographical directory, giving name, address, telephone number, products, and executive personnel of the various manufacturers.

This geographical section also gives the name of any other city in which a company may have a branch, and lists the branch under the city in which it is located.

Statistical Data

No. 2569 (Power Company, Illinois)—"If you have the information which I request below, will you please send it to me?

"Total number of household electric refrigerators in use in the United States.

"Total number of household gas refrigerators in use in the United States.

"Average revenue obtained from electric refrigerators in the United States.

"Average revenue obtained from gas refrigerators in the United States.

"Percentage of sales saturation to wired homes in the United States.

"Percentage of sales saturation to piped homes in the United States.

"Number sold each year since 1930 to date inclusive."

Answer: All available statistics concerning the electric refrigeration and air-conditioning industries are published in the 1935 Refrigeration and Air Conditioning Market Data Book.

Statistical information on gas refrigerators is not included in the Market Data Book.

The Market Data Book will answer your question concerning the total number of household electric refrigerators in use in the United States (for the total as of the present date you will have to supplement figures through 1934 as given in the book with sales totals for nine months as published in the November 6 issue of Electric Refrigeration News). The Data Book also gives estimates on average revenue obtained from electric refrigerators and other appliances, percentage of saturation to wired homes in the United States, and the number sold each year since 1930.

Air-Conditioning Manual

No. 2570 (Service Man, Michigan)—"Do you publish an Air Conditioning Engineering Manual? If not can you recommend a good air conditioning engineering manual?"

Answer: We have not published any books on air conditioning, but a good deal of timely information on this subject is published in the weekly issues of Electric Refrigeration News.

Electric Refrigeration News is the weekly newspaper of both the refrigeration and air-conditioning industries. Every issue of the News contains considerable information on air conditioning, with one issue each month devoted especially to this subject. These special issues report news of interesting installations and new developments in the field, as well as engineering, statistical, and service data and articles.

Specifications for 1935 air-conditioning equipment were published in the May 22 issue of Electric Refrigeration News. Back copies of the News can be obtained at a cost of 10 cents each.

Strictly technical information giving engineering data, calculation, and engineering tables is incorporated in the 1935 Guide of the American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York City. The price of this book, which may be obtained by addressing the society headquarters, is $5.00 per copy.

Another book which should prove of value to you is "Air Conditioning and Engineering" published by the American Blower Corp., 6000 Russell St., Detroit, Mich. A review of this book was published in the Sept. 4, 1935 issue of the News.

Replacement Parts

No. 2571 (Parts Jobber, Washington)—"We are interested in jobbing the following items, and would appreciate it if you can supply the addresses of the manufacturers:

"Karlberg replacement seals and insert compressor valves; piston pins and rings; U. S. gauges; Wabash tools; gas masks; Hinsdale refrigerator tools; Williams wrenches; Prest-O-Lite products; automatic refrigerator lights; refrigerator door gaskets; motor pulleys; carbon motor brushes; refrigerant cylinders and drums; Woodruff keys; Allen set screws and wrenches; Walden wrenches; and refrigerator hardware."

Answer: All manufacturers of refrigeration and air-conditioning parts, materials, and supplies are listed in the 1935 Refrigeration Directory and Market Data Book. This Directory is published for the purpose of answering such questions as it is impossible for us to prepare individual lists in answer to the thousands of requests for such information.

Karlberg replacement seals and valves are manufactured by the Trico Compressor Service, Inc., 42 N. Paulina St., Chicago, Ill.

United States gauges are manufactured by the United States Gauge Co., 44 Beaver St., New York City.

Prest-O-Lite products are manufactured by Prest-O-Lite, Inc., 30 E. 42nd St., New York City.

Hinsdale Manufacturing Co., 427 W. Randolph St., Chicago, Ill., makes Hinsdale refrigeration tools.

Woodruff keys are manufactured by the Standard Horse Nail Co., New Brighton, Pa.

Allen set screws and wrenches are manufactured by the Allen Manufacturing Co., 133 Sheldon St., Hartford, Conn.

Stevens-Walden, Inc., Worcester, Mass., makes Walden wrenches.

Williams wrenches are manufactured by the J. H. Williams & Co., 77 Spring St., New York City.

Manufacturers of piston pins and rings are listed on page 272 of the directory. A company which recently entered this field and is not listed in the directory is the Perfection Refrigeration Parts Co., Harvey, Ill.

The following are page references to lists in the directory of manufacturers of the various products about which you inquire: gas masks, 334; refrigerator lights, 180; refrigerator door gaskets, 229; motor pulleys, 272; carbon motor brushes, 282; refrigerator hardware, 230.

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RATES: Fifty words or less, one insertion $2.00, additional words four cents each. Three insertions $5.00, additional words ten cents each.

PAYMENT in advance is required for advertising in this column.

REPLIES to advertisements with Box No. should be addressed to Electric Refrigeration News, 5229 Cass Ave., Detroit, Mich.

POSITIONS WANTED

SALES BUILDER AVAILABLE. This man can render your company a first class service in connection with the sale of electrical appliances. He is 32 years old. Has had 10 years' experience as salesman, sales manager and manager, selling refrigerators, washers, ironers and cleaners, for a public utility, department store and specialty stores. He is quite familiar with various phases of merchandising and organization. Will be glad to give full details of qualifications. Write Box 745, Electric Refrigeration News.

FACTORY REPRESENTATIVE WANTED

EASTERN manufacturer of artificial food for use in domestic refrigerators has exceptional opening for Chicago, Pacific Coast and Canada representative. Must be acquainted with distributors and manufacturers and able to invest $1,000.00 for merchandise. Big field. Proposition should net right man from $5,000.00 to $10,000.00. Write in detail about yourself. Box 741, Electric Refrigeration News.

SERVICE MEN WANTED

NATIONAL Sales Organization, selling electric water coolers and drinking fountains combined, and electric refrigeration, desires contacts with service organizations in every locality in the United States. Write stating qualifications, and prices for service, to L. K. McDorman, 613 Fifteenth St., N.W., Washington, D. C.

EQUIPMENT FOR SALE

FOR SALE CHEAP:—Used 2" refrigeration pipe, including U coils, and flanged couplings on all ends: Ammonia valves and fittings, 200 horsepower electric motor, 24"x100' long leather belt, 500 300-lb. ice manufacturing cans, 50,000 creosote paving blocks, Turborgear reducer, 80' overhead electric traveling crane, lumber and steel bargains. Joyce Wrecking Co., 6235 Schaefer Rd., Dearborn, Mich.

SCHOOLS

REFRIGERATION-AIR CONDITIONING. Installation, servicing, estimating, and engineering sales, taught thoroughly by our method of combining theory and practice in well equipped school and laboratory. Full time or part time courses. Resident school. Call, 'phone or write. Detroit School of Refrigeration, 6517-6519 Grand River, Detroit, Mich. Garfield 0132.

REPAIRS

HALECTRIC thermostat repair service. B & B, G.E., Cutler-Hammer, Penn, Ranco, Tag., etc. Expansion valves repaired. Gas service, Ethyl, Methyl, Iso-Butane, Sulphur. Your cylinder or ours. Competitive prices. Halectric Laboratory, 1793 Lakeview Road, Cleveland, Ohio.

PATENTS

HAVE YOUR patent work done by a specialist. I have had more than 25 years' experience in refrigeration engineering. Prompt searches and reports. Reasonable fees. H. R. Van Deventer (ASRE), Patent Attorney, 342 Madison Avenue, New York City.

HERMETIC UNITS REPAIRED

GENERAL ELECTRIC SEALED UNITS—repaired, rebuilt, exchanged. Guaranteed service. Our modern shop is especially equipped to efficiently repair these units. Prices low and workmanship the best. Give model number when writing. Immediate service. Rex Refrigeration Service, 446 East 79th St., Chicago.

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For 9 years we have been training men for positions in the refrigeration field . . . "readying" them so the kind of men the industry needs will be available when and where they are needed. We know the kind of training a man requires to succeed in refrigeration work. That is the kind of training we give. In addition to benefiting the man, we believe it benefits the industry as a whole.

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